EVALUATION OF CARDIOVASCULAR FUNCTION IN WEANING FAILURE

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This study is wholeheartedly dedicated to my beloved parents, who raised me, inspired me, supported me, taught me and motivated me in every aspect of life

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Information is not enough. Neither is knowledge. We need wisdom-The Character of the Aquarian Age.

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Dr. Vaibhav Taneja

LIST OF ABBREVIATIONS

ABG	:	Arterial Blood Gas
ASE	:	American Society of Echocardiography
BMI	:	Body Mass Index
BNP	:	Brain Natriuretic Peptide
DBP	:	Diastolic Blood Pressure
DCT	:	Deceleration Time
EACVI	:	European Association of Cardiovascular Imaging
ECG	:	Electrocardiogram
EF	:	Ejection Fraction
Fig.	:	Figure
FiO_2	:	Fraction Of Inspired Oxygen
HR	:	Heart Rate
ICU	:	Intensive Care Unit
IVC	:	INFERIOR VENE CAVA
LA	:	Left Atrium
LAP	:	Left Atrial Pressure
LV	:	Left Ventricular
LVDD	:	Left Ventricular Diastolic Dysfunction
LVEF	:	Left Ventricular Ejection Fraction
LVFP	:	Left Ventricular Filling Pressure
MV	:	Mechanical Ventilation
PEEP	:	Positive End Expiratory Pressure
POCUS	:	Point Of Care Ultrasound
PPV	:	Positive Pressure Ventilation
PS	:	Pressure Support
PSV	:	Pressure Support Ventilation
PWD	:	Pulse Wave Doppler
RR	:	Respiratory Rate
RSBI	:	Rapid Shallow Breathing Index
RV	:	Right Ventricular
RWMA	:	Regional Wall Motion Abnormalities
SBT	:	Spontaneous Breathing Trial

SOFA	:	Sequential Organ Functional Assessment
SpO2	:	Oxygen Saturation
SGA	:	Subjective Global Assessment
SBP	:	Systolic Blood Pressure
TAPSE	:	Tricuspid Annular Plane Systolic Excursion
TDI	:	Tissue Doppler Imaging
TTE	:	Transthoracic Echocardiography
TV	:	Tidal Volume
VILI	:	Ventilator Induced Lung Injury
VR	:	Venous Return
WiCD	:	Weaning Induced Cardiac Dysfunction
WiPO	:	Weaning Induced Pulmonary edema
WF	:	Weaning Failure
WS	:	Weaning Success

ABSTRACT

Introduction: Cardiac dysfunction with limited reserve hinders weaning. TTE at the bedside assesses cardiac function, informing management plans. Our study thus explored TTE parameters predictive of weaning failure

Aim and objectives: Evaluation of incidence of left and right ventricular dysfunction in patients with WF and to investigate the relationship between cardiovascular dysfunction and duration of MV, as well as stay in ICU.

Materials & Methods: This prospective, observational study was conducted on 150 patient undergoing weaning in the ICU units of DMCH Ludhiana from 1st August 2022 to 30th September 2024. Baseline TTE and post SBT TTE was done and recorded. The primary outcome of the study was to assess the incidence of LV/RV dysfunction in patients with WF. Secondary outcome was to assess its effect on the duration of MV and length of ICU stay. The data collected was statistically analyzed using (Statistical Package for the Social Science) SPSS 21.0 version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

Results: RV systolic, LV systolic and LVDD are prevalent in the general ICU population. The prevalence of RV, LV systolic dysfunction and LVDD is 7.1%, 19.3%, 7.3% in this study. RV systolic dysfunction was significantly associated with LV systolic dysfunction which was also significantly linked to prolonged MV requirement Also, the proportion of patients with severe LV systolic dysfunction significantly increased on weaning which might indicate weaning induced cardiac dysfunction. However, there was no correlation between RV systolic dysfunction, and LVDD on duration of mechanical ventilation or ICU stay in this study.

Conclusion:

While TTE can aid in diagnosis, early recognition of new or worsening cardiac dysfunction induced during the process of weaning, is crucial to optimize weaning outcomes and prevent further cardiac damage. Tailored pharmacotherapy and gradual weaning from MV with some pressure support is helpful for managing LV systolic dysfunction and improving weaning success. The management of LVDD relies on The CHEOPS bundle. This study thus provides valuable insights into cardiovascular dysfunction during weaning, guiding evidence-based strategies for improved patient outcomes.

Keywords: Weaning Failure (WF), Transthoracic Echocardiography (TTE), Right Ventricular (RV), Left Ventricular (LV), Left Ventricular Diastolic dysfunction (LVDD)

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INTRODUCTION

Weaning is the staged process of liberating a patient from machine-assisted ventilation to patient's own breathing. Approximately 40% of the total time a patient spends on mechanical ventilation (MV) is spent on the weaning process.[1] The process of weaning critically ill patients from MV can be tough and challenging for both the patient and the healthcare team. Weaning any patient from MV requires comprehensive and accurate clinical assessment which when coupled with careful management improves weaning outcome.

Initiation of weaning from MV should be started as early as possible and on the resolution of the primary pathology.[2] A patient is considered successfully weaned if they remain extubated and do not require invasive MV for 48 hours post-extubation.[2] Weaning failure (WF) on the other hand is defined as the inability of a patient to pass a spontaneous breathing trial (SBT) or a patient requiring reintubation within 48 hours following extubation.[2]

The timing of weaning is crucial, as premature weaning or delayed weaning can both lead to WF. Failure to wean is further associated with unfavorable outcomes affecting all organ systems which together lead to prolonged duration of MV, increased duration of stay and mortality in the intensive care unit (ICU), poor prognosis, among other complications.[3–5] Thus, choosing an appropriate weaning time can help reduce the complications associated with MV, shorten the duration of stay in ICU and alleviate the financial burden on patients.

The pathophysiology of WF is complex and multifactorial. Systemic or multi-systemic comorbidities of various organ systems including cardiovascular, respiratory, endocrine, hematopoietic, metabolic, nutritional, neuromuscular, sepsis and its complications etc. can all lead to WF.[6] While the most common cause of WF is pulmonary, cardiac dysfunction in itself is associated with difficult weaning.[7–10] Approximately one-third of patients who experience WF have an underlying cardiac issue, which is either pre-existing or may arise during the process of weaning.[7,8,11] Furthermore, cardiac dysfunction

is very common in patients with prolonged weaning, with prevalence rates of 22% for left ventricular (LV) systolic and 39% for LV diastolic dysfunction.[10] Consequently, the mechanical markers of weaning (e.g. respiratory rate, minute ventilation, tidal volume, rapid shallow breathing index, maximum inspiratory pressure etc. are inadequate determinants of weaning success (WS) as they take do not take into account the functional physiology of the cardiovascular system.[10] As a result, WF of cardiovascular origin may remain underdiagnosed and undertreated, primarily due to lack of clinical suspicion.[8]

As patients progress through weaning, they transition from mechanical support to independent, self-sustained respiration. This sudden shift from positive pressure ventilation (PPV) to spontaneous breathing during the process of weaning is associated with rapid physiological changes due to modified heart-lung interactions which increase the cardiac load and oxygen demand, potentially exacerbating cardiac dysfunction.[12] These modifications further elicit an excessive burden on both the respiratory and cardiovascular systems contributing to WF.[12] Thus, any impairments in systolic or diastolic function, whether pre-existing or newly developed, in either the left or right ventricle, can independently compromise the weaning process and contribute to WF.[7–9,13] Thereby, a thorough and systemic search for potential new or worsened preexisting cardiac pathologies that can delay the process of weaning is necessary to decrease the duration of MV days, prevent long-term complications and improve the patient outcome.

Transthoracic echocardiography (TTE) is a widely used, non-invasive, and highly reproducible cardiac diagnostic tool.[14] TTE provides comprehensive information on all four chambers and all four valves of the heart.[15] Further, point of care ultrasound (POCUS) trained healthcare professionals can seamlessly integrate TTE into their practice.[16] TTE is thus very commonly used in the ICU at the bedside for assessing the cardiac structure and functions in real time.[17] TTE provides in-depth information on the dynamics of cardiac function as well as represents an extension of the bedside cardiac examination.[14]

Right ventricular (RV) systolic function can be quantitatively evaluated using TTE with motion mode imaging, where tricuspid annular plane systolic excursion (TAPSE) serves as a robust indicator of RV contractility.[18,19] LV systolic function can be simply assessed qualitatively through visual estimation of left ventricular ejection fraction (LVEF), taking into account the size and motion of various segments of the left ventricle.[20] LV diastolic function assessment involves obtaining multiple parameters on tissue doppler imaging (TDI) and pulsed wave doppler (PWD). TDI in TTE is a relatively new and novel technique that measures the velocity and motion of the myocardial tissue.[21] Early diastolic mitral annulus velocity (e') as measured by TDI has been established as a relatively load independent index of myocardial relaxation.[21–23] Also, PWD derived mitral flow velocity in early diastole (E) reflects the driving pressure between the left atrium (LA) and the left ventricle. On indexing e' to E, which corrects E wave velocity LV relaxation, the E/e' ratio provides a precise assessment of mean pulmonary capillary wedge pressures which corelate with left atrial pressures (LAP). Additionally there is substantial link that E/e' ratio strongly correlate with left ventricular filling pressures (LVFP) measured invasively.[21,24] Further, LVFP during relaxation is a critical determinant of left ventricular diastolic dysfunction (LVDD). LVFP is also influenced by both intrinsic (contractility, stiffness) and extrinsic factors (preload, afterload) related to the heart and elevated LVFP during relaxation is suggestive of LVDD.

Both systolic dysfunction and diastolic dysfunction of the right and the left heart are prevalent in the ICU population and any delay in diagnosing may prolong the weaning process and increase both mortality and morbidity. Effective weaning from MV thus requires a comprehensive understanding of the cardiovascular response to weaning, including its dynamics and implications Thus the critical care team should harness the comprehensive data obtained on TTE to craft a personalized weaning plan, informing targeted clinical decisions.[25]

In general, optimization of therapeutic decisions during the weaning process relies on a deep understanding of the cardiovascular response

to weaning, including its implications and dynamics. Clinicians must grasp these complexities and effectively utilize available tools to guide the wean team. By leveraging these tools and expertise, clinicians can inform and optimize the weaning team's strategy, ensuring effective patient care. Consequently, our study seeks to evaluate the cardiac function of patients with WF using TTE parameters, with the goal of gaining valuable insights to inform patient care.

AIMS AND OBJECTIVES

Primary objective:

Evaluation of incidence of left and right ventricular dysfunction in patients with weaning failure from ventilator during the weaning process.

Secondary objective:

1. Effect of left ventricular and right ventricular dysfunction on duration of mechanical Ventilation, length of Intensive Care Unit stay.
2. Evaluation of other causes contributing to weaning failure.

REVIEW OF LITERATURE

WEANING AND WEANING SUCCESS

Weaning from MV should begin as soon as possible and upon resolution of the primary underlying pathology.[2] A patient is considered successfully weaned if they remain extubated and do not require invasive MV for 48 hours post-extubation.[2]

WEANING CLASSIFICATION AND WEANING FAILURE

In 2005 International Consensus Conference divided weaning into three categories (simple, difficult and prolonged weaning).[26] Simple weaning after a SBT is successful extubation on the first attempt. Difficult weaning patient takes up to three SBTs or up to seven days from the first SBT to be successfully extubated. If the patient fails at least three SBTs or requires more than 7 days from the first SBT to be successfully extubated it is then defined as prolonged weaning.[26] WF is defined as inability to pass SBT or requirement of reintubation within 48 hours following extubation.[2]

CAUSES OF WEANING FAILURE AND ITS ADVERSE EFFECTS

The incidence of WF in patients who are critically ill is about 26-39% for difficult to wean patients and 6-14% for patients with prolonged weaning.[27,28] Additionally, extubation failure occurs in a significant 2-25% of critically ill patients.[8,29] Unsuccessful weaning or a failed extubation has serious consequences which include prolonged MV, extended ICU stays, and increased mortality risk.[29–32] Reintubation in addition complicates the already compromised patient by increasing the chances of ventilator acquired pneumonia and infection.[33]

Impaired lung repair mechanisms along with multiple risk factors (e.g., underlying lung disease with surfactant dysfunction, malnourishment, infection, ageing, toxic effects of oxygen. etc.) further make critically ill patients vulnerable to ventilator-induced lung injury (VILI).[5] VILI, a is type of acute lung injury that is inflicted or aggravated by the process of MV during the course of treatment. Also, VILI has this extensive potential to independently prolong the duration of MV and substantially

increase the odds of morbidity and mortality.[5,34,35] Also, many of the serious complications of invasive MV are directly attributed to the duration of MV.[36] Thus, prolonged MV associated with WF or reintubation is detrimental and is associated with unfavorable outcomes which include increased length of stay in the ICU, additional strain on healthcare infrastructure and resources, higher risk of complications and death.[2,30–32]

Also, the pathophysiology of WF is complex and multifactorial. Altered sensorium, increased secretions, inefficient cough, critical illness myopathy, fluid overload states, sepsis or its complications all impede the process of weaning and increase the incidence of WF.[37–39] Although respiratory factors are the most common cause of WF, cardiac dysfunction significantly impact the ability to successfully wean patients from MV.[8]

CARDIOVASCULAR CAUSES OF WEANING FAILURE

Among cardiac dysfunction, there is substantial evidence that LV systolic and LV diastolic dysfunction may both lead to difficult weaning.[7,9,11,40,41] Additionally, cardiac dysfunction induced during the weaning process may manifest as either systolic[7] and or diastolic dysfunction.[42,43] Clinically, cardiovascular etiology as a predominant or a contributing factor to WF can be difficult to distinguish from other causes of WF due to multiple reasons. First, both subjective (such as discomfort, dyspnea, anxiety) and objective (tachypnea, tachycardia, wheezing, hypoxemia, hypercapnia) parameter for WF are nonspecific and usually incapable of discriminating cardiac from noncardiac causes of WF.[8] Second, sudden changes in intrathoracic pressure, preload and afterload induced by the process of weaning can precipitate cardiac dysfunction without any underlying heart disease.[40,44] Third, the application of pressure support (PS) with positive end expiratory pressure (PEEP) during SBT decreases LV preload and afterload, thereby improving LV emptying. Enhanced LV emptying alleviates load-dependent diastolic heart failure by reducing ventricular stiffness and improving diastolic function. This may initially mask weaning

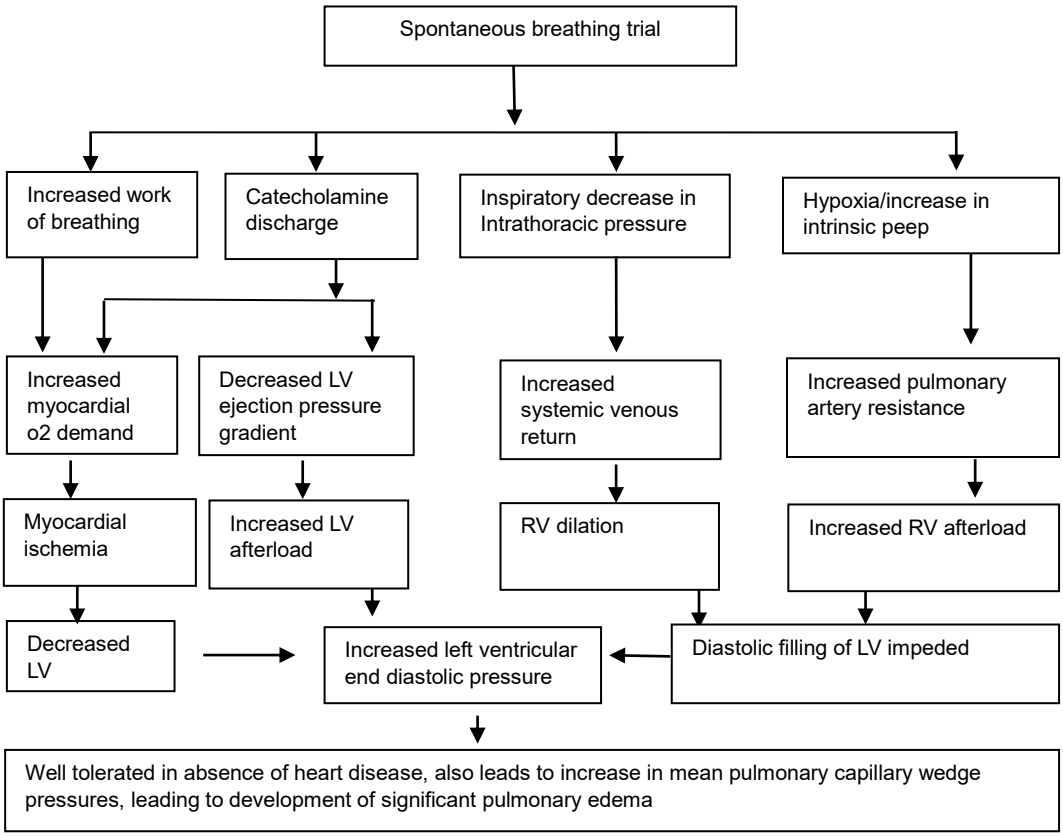
induced cardiac dysfunction only to become apparent post extubation when PS-PEEP is discontinued.[7,45] Fourth; greater preceding fluid administration in patients with sepsis is also associated with greater LVFP. Elevated LVFP, increased venous return (VR) together with LVDD may precipitate pulmonary edema leading to WF. [42] Volume overload states are thus associated with worse weaning outcome and an increased incidence of WF. [4,30,38,39,46] Fifth, the increased VR that occurs during SBT can lead to RV dilatation. The combination of RV dilatation, compromised baseline RV function, and heightened post-weaning sympathetic activity elevates cardiac workload, potentially resulting in poor tolerance.[9] Sixth; the right ventricle and left ventricle are interconnected through the shared interventricular septum and pericardial space, creating a synergistic relationship where LV contraction augments RV ejection- a phenomenon called systolic ventricular interaction.[47,48] This ventricular interdependence is constantly present but becomes more evident during sudden changes in respiration.[49] As both the ventricles operate in a mutually dependent, complex relationship, integrating their functions. Therefore, any dysfunction in the functioning of the left ventricle significantly affects the functions of the right ventricle.[49] Consequently, dysfunction of either left or right ventricle in systole or diastole can lead to WF. Hence, WF of cardiovascular origin may go underrecognized and undertreated due to insufficient clinical suspicion and diagnostic vigilance.[8]

Historically, the right ventricle has been relegated to a secondary role, with limited research focusing on its functional dynamics, effective detection and management. The right ventricle is particularly sensitive to changes in afterload (pulmonary vascular resistance) and preload, and weaning imposes several physiologic stresses on the right ventricle, which can exacerbate underlying dysfunction.[50] Thus, RV dysfunction during weaning from MV becomes an important clinical challenge. Existing research on RV dysfunction as a direct cause of WF or as a cause of prolonged weaning is limited. Conversely, impairments in LV systolic or diastolic function, whether pre-existing or

newly developed in the process of weaning, can independently compromise the weaning process and contribute to WF.[10,13,38,42,51,52] Thus, altered functioning of the heart, if present along with limited cardiovascular reserve becomes an important risk factor that can compound the process of weaning and prolong the ventilatory requirement.[8,53]

The cardiopulmonary interactions induced by MV during the weaning process are complex and are associated with changes in hemodynamics. The hemodynamic responses generated during the process of weaning include cardiovascular dysfunction, autonomic alteration, cardiac dysrhythmias, and myocardial ischemia. Any sudden change from MV to spontaneous breathing induces: First, a negative intrathoracic pressure which, (a) increases the VR, the RV preload, the central blood volume, LV preload and LVFP (b) it also increases the surrounding pressure of the left ventricle with a resulting increase in LV afterload; Second, an increase in the work of breathing, and, third, an increase in adrenergic tone as documented by an increase in serum catecholamine levels.[54,55] All of these rapid changes that occur during transition from PPV to spontaneous ventilation in the process of weaning precipitate cardiac dysfunction (Fig. 1).[54,56–58] Also, sudden increase in cardiac work and myocardial oxygen demand during a trial of weaning can precipitate weaning induced cardiac dysfunction (WiCD) and weaning-induced cardiac pulmonary edema (WiPO), even in patients without pre-existing heart disease.[44,53,56–59]

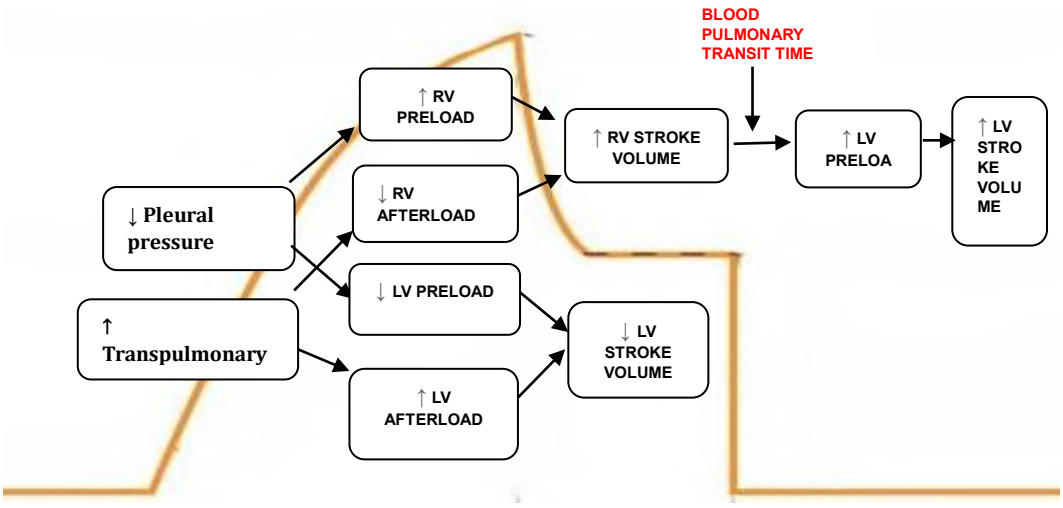
FIGURE 1: Mechanism of cardiac dysfunction induced during the process of weaning from mechanical ventilation


Spontaneous breathing trial
Increased work of breathing
Catecholamine discharge
Inspiratory decrease in Intrathoracic pressure
Hypoxia/increase in intrinsic peep
Increased myocardial o2 demand
Decreased LV ejection pressure gradient
Increased systemic venous return
Increased pulmonary artery resistance
Myocardial ischemia
Increased LV afterload
RV dilation
Increased RV afterload
Decreased LV
Increased left ventricular end diastolic pressure
Diastolic filling of LV impeded
Well tolerated in absence of heart disease, also leads to increase in mean pulmonary capillary wedge pressures, leading to development of significant pulmonary edema

An accurate diagnosis of WiCD and WiPO is thus crucial, as their treatment may necessitate adjustment of weaning strategies.[8] Electrocardiogram (ECG) changes indicating myocardial ischemia during weaning are uncommon in the ICU population at large.[60–62] Notably, studies using myocardial perfusion scintigraphy have detected LV RWMA during weaning from MV, even in the absence of concurrent ECG changes.[46,63] Alternatively, WiCD can be diagnosed at the bedside via echocardiography by observing new or worsening LV wall motion abnormalities during weaning.[13] However, for WiPO lung ultrasound can easily detect B-lines which are pathognomonic of pulmonary edema.[64] The diagnosis of WiPO is also supported by elevated plasma brain natriuretic peptide (BNP) levels, which surge in response to sudden increase in the LVFP during weaning.[56] Thus, both BNP or NT-proBNP act as surrogate markers of cardiovascular dysfunction in patients with WF.[8] High baseline BNP or NT-proBNP levels,[43,65,66] or significant increase in serum BNP during SBT are also

associated with WiPO and WF.[56,67,68] Further, BNP-guided fluid management decreases weaning duration from MV, outperforms physician-guided fluid optimization and maintains stable central hemodynamics and renal function.[67,68] Also, diuretics or renal replacement therapy to achieve a net negative fluid balance reduces cardiac preload thereby protecting against pulmonary edema during weaning.[8] Thus, fluid balance correction is a very important, modifiable factor that warrants routine attention from intensivists alongside identifying echocardiographic parameters of cardiac dysfunction.

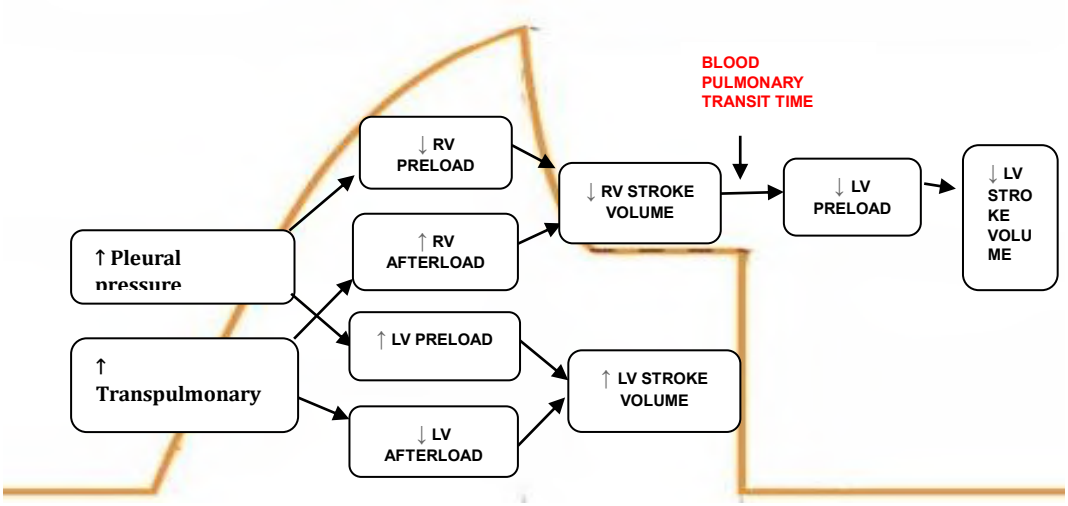
FIGURE 2: Summary of heart–lungs interaction during spontaneous breathing trial



INSPIRATION	EXPIRATION

During SBT, inspiratory increase in RV preload and decrease in LV preload are the two predominant global effects of ventilation on cardiac loading conditions.

FIGURE 3: Summary of heart–lungs interaction during mechanical ventilation



INSPIRATION	EXPIRATION

During MV (in patients with healthy lungs and heart), decrease in RV preload and increase in LV preload during insufflation are the two predominant global effects of ventilation on cardiac loading conditions.

ASSESSMENT OF WEANING READINESS AND ITS LIMITATIONS

Once the primary pathology is resolved, assessment of patients for weaning is based on a combination of subjective and objective parameters. While subjective parameters focus on normal temperature, good mentation, adequate cough reflex, stable vitals and hemodynamics. The objective parameters evaluate the physiology and mechanics of the respiratory system. Assessment of respiratory physiology involves analysis of arterial blood gases (ABG) and calculation of indices which reflect the compliance, resistance, oxygenation, and pressure of the airways. On the other hand, mechanical parameters assess the respiratory rate (RR), minute ventilation, tidal volume (TV), vital capacity, rapid shallow breathing index (RSBI) and maximum inspiratory pressure. The above

parameters based on respiratory mechanics, gas exchange, and breathing pattern predict the outcome of weaning without taking into account the functioning of the cardiovascular system.[69–71] While, many of these indices have good sensitivities but most have low specificities.[69–72] The predictive value of RSBI, MV duration, and cough strength for reintubation is also suboptimal, highlighting the need for more accurate indicators.[73–76] Also, RSBI with a value of less than one hundred and five cannot identify the possibility of extubation failure.[69,77] A 30-minute SBT is a very valuable tool, but its reliability is also limited, and extubation failure still occurs in 15 to 20% of cases.[4,28,78] All of these traditional weaning parameters focus exclusively onto the functioning of the respiratory system completely neglecting the interconnected cardiovascular system.[79]

TRANSTHORACIC ECHOCARDIOGRAPHY IN WEANING

These functional and morphological changes that occur in the cardiovascular system during the process of weaning can be assessed at the bedside by TTE in real time. TTE provides pivotal information regarding cardiac morphology, systolic function, diastolic function, and other significant cardiac pathology.[55] Further TTE in serial is both quick, reliable, noninvasive and associated with minimal patient inconvenience. POCUS trained healthcare professionals can seamlessly integrate TTE into their practice.[16] TTE is thus very commonly used in the ICU at the bedside for assessing the cardiac structure and functions in real time.[17] It provides in-depth information on the dynamics of cardiac function as well as represents an extension of the bedside cardiac examination.[14] Thus, non-invasive estimation of both LV/RV systolic and LV diastolic function by POCUS should be fully integrated into bedside assessment of haemodynamic to predict WS in critically ill patients and to guide the wean team.

LEFT VENTRICULAR SYSTOLIC FUNCTION ASSESSMENT BY TRANSTHORACIC ECHOCARDIOGRAPHY

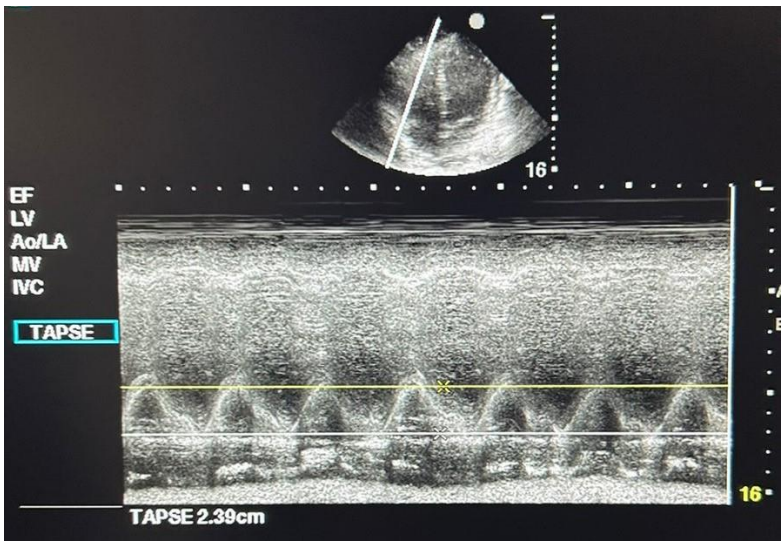
Two-dimensional (2D) echocardiography, Motion-mode echocardiography, and Doppler echocardiography are all used to

assess the function of LV/RV, both during systole as well as in diastole. LV systolic function assessment can be done easily by the visual gestalt method which is a subjective, qualitative method. It involves evaluating the LV contractility based on endocardial thickening and motion of various segments through visual inspection of 2D echocardiographic images. The systolic function of LV can be visually estimated using a subjective assessment in four key echocardiographic views: parasternal long axis, parasternal short axis, apical four-chamber, and subcostal view. A qualitative visual assessment of the heart might also RWMA. LV systolic function on the basis of visually observed ejection fraction (EF) is then classified as hyperdynamic (LVEF greater than 70%), normal (LVEF 50% to 70%) or mild dysfunction (LVEF 40% to 49%), moderate dysfunction (LVEF 30% to 39%) and severe dysfunction (LVEF less than 30%).[80]

RIGHT VENTRICULAR SYSTOLIC FUNCTION ASSESSMENT BY TRANSTHORACIC ECHOCARDIOGRAPHY

RV systolic function also can be assessed easily on M-mode echocardiography by measurement of TAPSE in the apical four chamber view. TAPSE refers to the systolic longitudinal displacement of the lateral tricuspid annulus towards the apex and any TAPSE of less than 17 mm defines RV systolic dysfunction.[80]

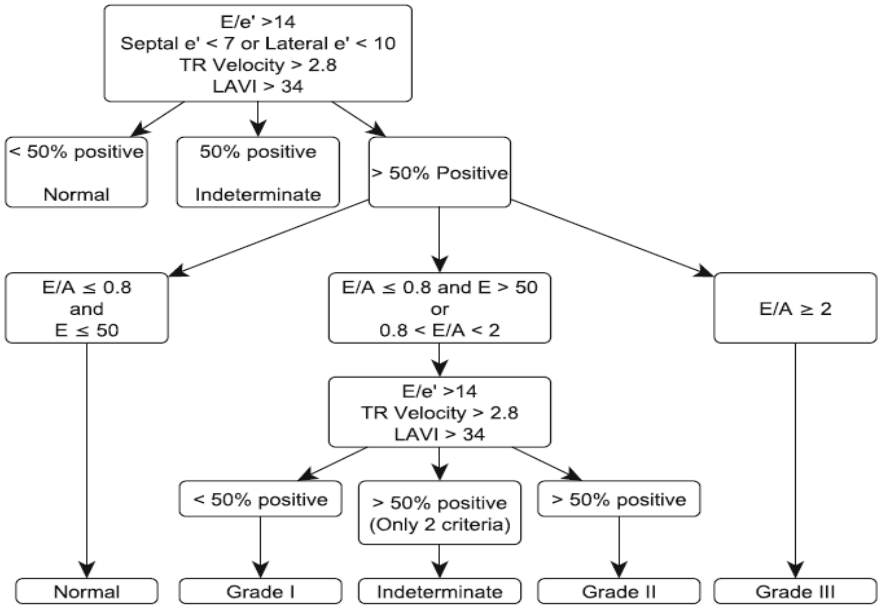
FIGURE. 4 Echocardiographic assessment of tricuspid annular plane systolic excursion on M-Mode



LEFT VENTRICULAR DIASTOLIC FUNCTION ASSESSMENT BY TRANSTHORACIC ECHOCARDIOGRAPHY

The assessment of LV diastolic dysfunction involves identifying structural alterations (e.g., LV hypertrophy) and functional markers (LVFP and relaxation) through echocardiography.[81] The parameters recommended by The American Society of Echocardiography/European Association of Cardiovascular Imaging (ASE/EACVI) to assess LV diastolic function and filling pressures is based on a combination of: mitral inflow velocities (E wave, E/A ratio), tissue Doppler imaging (septal/lateral e′, average E/e′), left atrial (LA) volume index, and peak tricuspid regurgitation velocity, supplemented by pulmonary venous flow assessment.[81] However, the diagnostic reliability of diastolic dysfunction using the 2016 ASE/EACVI guidelines is hindered by significant inter-operator variability (12-84%) and prolonged assessment times.[82] Also, the 2016 ASE/EACVI guidelines fails to classify diastolic function in approximately one-third of septic patients and may misclassify some individuals with elevated filling pressures as normal.[83]

FIGURE. 5 Classification of the diastolic dysfunction as recommended in 2016 by the american society of echocardiography / european association of cardiovascular imaging



E, early diastolic blood flow velocity across the mitral valve. e′, mitral annulus velocity at early diastole. TR, tricuspid regurgitation. LAVI, left atrial volume index. A, late diastolic blood flow velocity across the mitral valve. DCT, deceleration time in which mitral E velocity decrease from its peak to zero.

A more straightforward, E/e′-based classification, on the other hand precisely classifies septic patients and corresponds with pertinent comorbidities associated with diastolic dysfunction.[83] Also, a simplified POCUS protocol employing E/A and E/e' ratios provides a reliable and efficient method for diagnosing diastolic dysfunction.[83] Thus, for POCUS purposes, a practical approach limited to one or two indices, acquired in apical 4-chamber view, is often sufficient to obtain information. Of these, the preferred initial parameters are assessment of trans-mitral inflow velocities by PWD and TDI at the septal or the lateral mitral annulus.

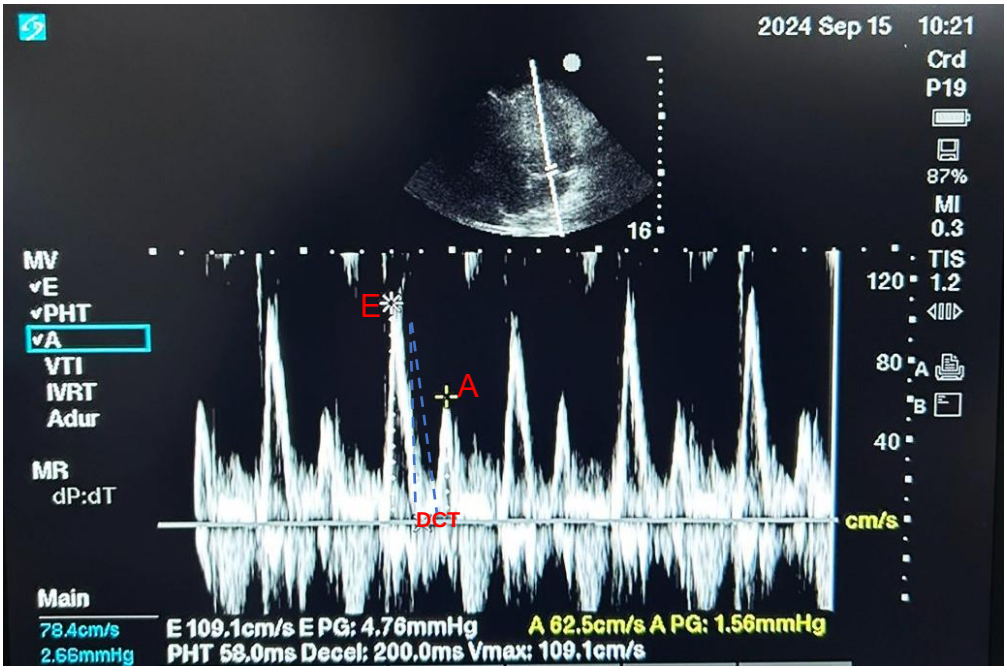
PWD analysis of LV diastolic filling patterns enables assessment of trans-mitral flow velocity during diastole through three key parameters: E-wave (represents early diastolic filling), E-wave deceleration time (DCT), and A-wave (represents late diastolic filling). In healthy individuals, LV filling primarily occurs during early diastole, characterized by an E-wave peak velocity exceeding the A-wave peak velocity (E/A ratio ≥ 0.8 m/s) and a DCT of 160-200ms. However, as LV diastolic function deteriorates and LAP pressures rise, the trans-mitral flow velocity pattern undergoes significant changes.

Initially, abnormal relaxation filling pattern emerges, marked by reduced LV compliance and relaxation, decreased early diastolic velocity (E-wave < 0.5 m/s), and increased LA contribution in late diastole, resulting in an E/A ratio < 0.8 m/s. As diastolic dysfunction progresses, the pseudonormal filling pattern develops, characterized by elevated LAP compensating for high LV diastolic pressures, increased early diastolic filling velocity (E-wave ≥ 0.5 m/s), and

pseudonormalization of the E/A ratio (≥ 0.8 m/s). Ultimately, severe LV diastolic dysfunction leads to a restrictive filling pattern, featuring chronic elevation in LVFP, LA dilation, high early diastolic filling velocity (large, narrow E wave), reduced LA contribution, and an E/A ratio ≥ 2 m/s. These unique patterns provide valuable insights into the development of diastolic dysfunction and also guide clinical decision-making.

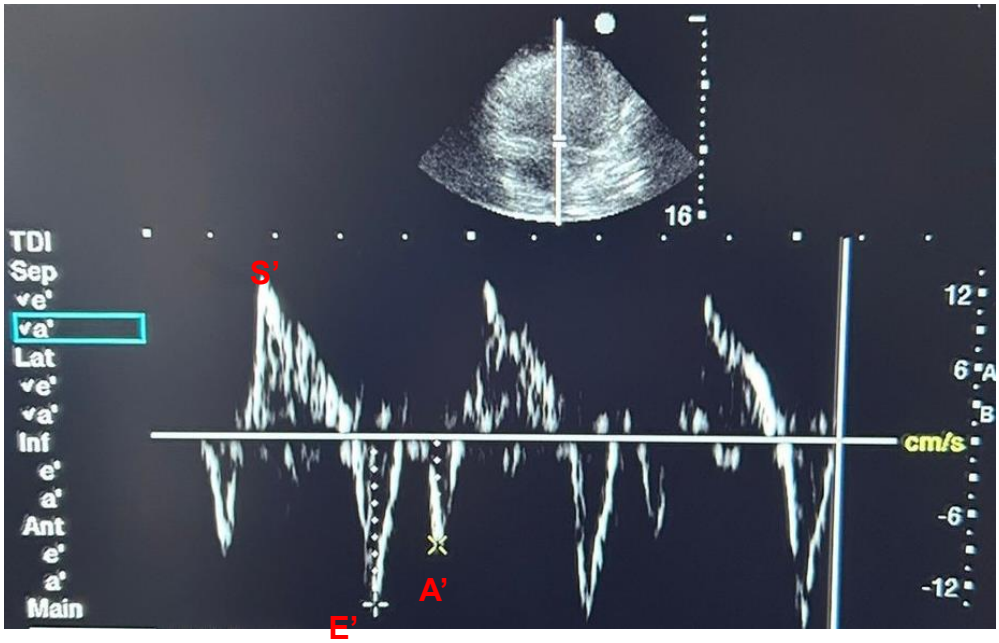
The DCT of mitral E velocity also plays a crucial role in predicting outcome of patients.[13] DCT is determined by the interplay of three key factors including LV relaxation rate, LV pressure after mitral valve opening, and ventricular stiffness, impacting diastolic blood flow. The combined effects of these factors influence early diastolic blood flow into the left ventricle, making DCT a sensitive indicator of diastolic function.

FIGURE. 6 PWD Analysis of trans-mitral flow velocity during diastole. E-Wave (Represents early diastolic filling), E-Wave deceleration time (DCT), and A-Wave (Represents late diastolic filling).



TDI is a powerful echocardiographic modality that offers detailed evaluation of myocardial function, including global and regional systolic and diastolic dynamics. TDI is a relatively novel technique that measures the velocity of myocardial motion by analysing the longitudinal component of cardiac contraction throughout the cycle. Pulsed wave TDI velocities can be accurately measured by positioning the sample volume at either the septal or the lateral mitral annulus. Over a cardiac cycle the TDI signal displays three distinct peak, a positive systolic peak and two negative diastolic peaks. The positive systolic s' wave represents LV systolic contraction. The negative wave e' represent the early LV diastolic relaxation and a' wave represents active atrial contraction in the late diastole (Fig.6)

FIGURE. 7 TDI Analysis of the septal mitral annulus showing the S', E' and A' Waves



The s' wave at the mitral annulus represents LV systolic function and is preceded by brief isovolumic contraction. The e' wave which is preceded by a brief isovolumic relaxation is derived from early diastolic velocities and serves as a reliable marker of diastolic function and LVFP.[84] In the apical four-chamber view, the e′ mitral annular velocity can be measured from either the septal or lateral annulus.[81,84] However, regional differences exist in e' velocity, with higher values observed in lateral when compared between the anterior and septal segments.[84] A decreasing e' velocity is indicative of worsening LVDD, reflecting gradual decline in the LV relaxation and compliance. In individuals with normal left ventricular diastolic function and relaxation, e′ velocity exhibits a direct relationship with the transmitral pressure and indexing e′ to E velocity for E/e′ does not correlate with LVFP. However, when LVFP are within normal limits, but LV relaxation is impaired due to normal aging or diastolic dysfunction, both E and e′ velocities decrease. As diastolic dysfunction advances, LV relaxation further deteriorates, resulting in decreased e′ velocity and reduced LV compliance. This progression leads to elevated LVFP and subsequently increased E velocity. Thus, increased E/e′ ratio is a marker for increased LVFP and LAP.[85,86] Also, the E/e' average ratio,

which corrects E-wave velocity for LV relaxation, provides an accurate assessment of LAP and mean pulmonary capillary wedge pressure.[87] Ommen et al. established E/e' cutoff values for estimating LVFP. A E/e' < 8 indicates normal LVFP, while E/e' ≥ 15 suggests elevated LVFP, with values between 8-15 being indeterminate.[86] Other researchers also proposed streamlined criteria for diagnosing diastolic dysfunction in adults where lateral e' >12 cm/s and septal >8 cm/s indicate normal LV function, while lateral e' <8 cm/s was suggestive of diastolic impairment.[83,84,88,89]

The a' velocity is useful in evaluating atrial dysfunction and represents the contractile functions of the LA.[90] There is no discernible regional variation in the a' velocity when measured from the lateral or septal walls, and the a' velocity rises with age.[84] The atrial fraction, atrial ejection force, and transmitral peak A velocity are further indicators of LA activity that correlate with the a' velocity.[90,91]

CLASSIFICATION OF THE DIASTOLIC DYSFUNCTION BASED ON SIMPLIFIED DEFINITION

According to the simplified protocol LVDD is categorized into four grades based on transmitral inflow and TDI parameters.[92]

TABLE 1: Classification of diastolic dysfunction based on simplified definition

Grading of LVDD	PWD AND TDI parameters		
	E/A	Septal e' or average e' in RWMA (cm/s)	E/e'
Grade 0:	≥0.8	≥8	<8
Grade 1:	<0.8	≤8	≤8
Grade 2: (psuedonormal pattern)	≥0.8	≤8	8-15
Garde 3: (restrictive pattern)	≥2	<8	>15

Grade 0 represents normal mitral inflow. Grade 1 diastolic dysfunction, indicates impaired relaxation of the left ventricle. Notably, Grade 1 can be a normal finding in the elderly due to physiological aging, with the primary distinction from Grade 0 being the E/A ratio. Grade 2 diastolic dysfunction, or pseudonormal pattern signifies worsening LV stiffness, increased LVFP and increased LAP, often accompanied by LA enlargement. The E/e' ratio is crucial in identifying pseudonormalization and differentiating Grade 0 from Grade 2. Grade 3 diastolic dysfunction, or restrictive pattern indicates substantial decrease in LV compliance, leading to severe increases in LAP.

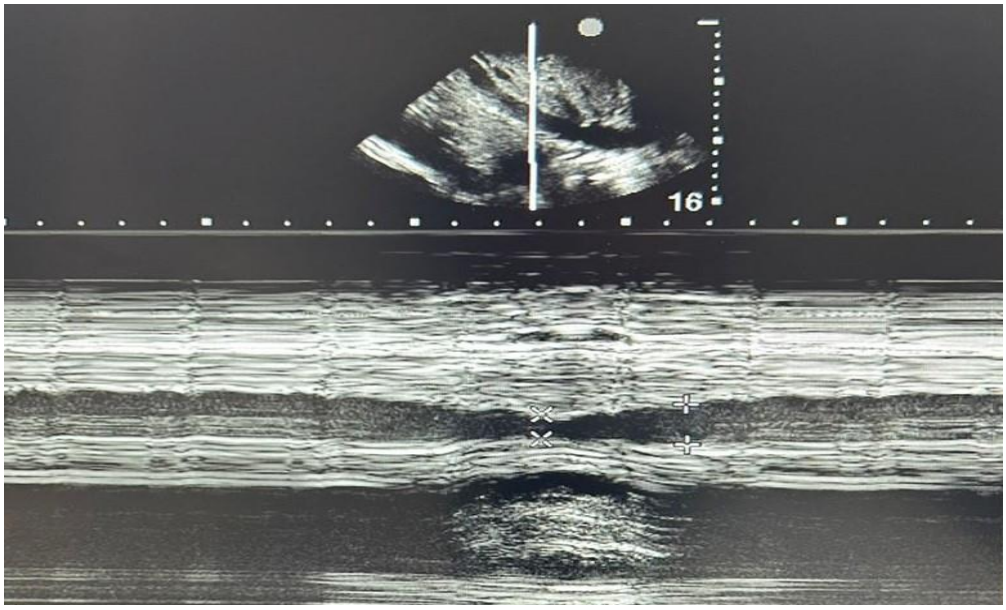
Although, the simplified approach (E/A and E/e' ratios) reliably assesses LVDD and LVFP in most cases, certain indeterminate conditions may require additional parameters for accurate evaluation.[92] These ambiguous scenarios include: E/A ratio < 0.8 with E/e' ratio > 8 and E/A ratio = 0.8-2 with E/e' ratio < 8. In such situations, integrating supplementary parameters including left atrial volume index and peak tricuspid regurgitation velocity becomes crucial for resolving diagnostic uncertainty and ensuring accurate assessment of diastolic function. These supplementary parameters though they refine diastolic dysfunction assessment, but add complexity and time to the evaluation. Further, these parameters are difficult to measure in critically ill patients.[93,94] Thus for POCUS purposes, a simplified approach using E/A and E/e' ratios form a concise yet effective diagnostic duo for diastolic dysfunction assessment.[92] Furthermore, this simplified approach has far-reaching applications, extending beyond emergency diagnosis[95] to prognostication and monitoring, guiding therapy in critically ill patients.[94,96]

ECHOCARDIOGRAPHIC ASSESSMENT OF INFERIOR VENE CAVA

Evaluation of the Inferior Vena Cava (IVC) by echocardiography involves acquiring sagittal images of the IVC in the subcostal view. Using liver as an acoustic window, image of the IVC draining into the right atrium can be visualized. Then using M-mode echocardiography, IVC diameter both maximum ($IVCmax_{dia}$) and minimum ($IVCmin_{dia}$) is

measured 2cm proximal to the opening of the hepatic vein confluence. These variations in the diameter of the IVC arise due to heart lung interactions and can be measured by ultrasound. During spontaneous inspiration, negative intrathoracic pressure increases VR to the heart and reduces the IVC_{dia}.[97] At end expiration, the intrathoracic pressure increases to zero, reducing the VR and maximizing the IVC_{dia}.[97] This has been defined as IVC collapsibility index (IVCCI).[97] and is measured as IVCCI[97] =$(IVCmax_{dia}-IVCmin_{dia})/IVCmax_{dia}$. With MV, the cycle is inverted. Positive intrathoracic pressure during inspiration decreases the VR to the heart and increases the IVC diameter. At end expiration, the intrathoracic pressure decreases to zero, increasing the VR to the heart and minimizing IVC diameter.[97,98] This has been defined as IVC distensibility index (IVCDI).[98] and is calculated as IVCDI[98] =$(IVCmax_{dia}-IVCmin_{dia})/IVCmin_{dia}$. The assessment of IVC diameter, collapsibility, and distensibility index provides valuable guidance for optimizing patient fluid management.[99–101] Also, serial evaluations of IVC_{dia}, IVCCI, IVCDI can enhance fluid management precision, guiding timely resuscitation and de-resuscitation interventions to achieve optimal patient outcome.[100,102–104]

FIGURE .8 Echocardiographic assessment of inferior vene cava



In a small trial, Lemaire et al. noted that patients who failed SBT had significant higher levels of pulmonary artery occlusion pressure. The study also found that E/A >0.95 and E/e' >8.5 were consistent with development of pulmonary edema at the end of SBT thus identifying patients with risk of WF due to WiPO.[46]

A study conducted by Roche Campo et al. in found that overall prevalence of LV systolic and diastolic dysfunction was more frequent in patients with prolonged weaning. Also, individuals who failed the weaning trials showed a significant change in diastolic relaxation as measured by a lower e′ velocity along with a considerable rise in LVFP as measured by a higher E/e' ratio.[10]

A review of literature by Routsi et al. highlighted the need for the identification of WF of cardiovascular origin using various methods and techniques. The study also provided treatment therapies for patients with WF of cardiovascular origin for successful extubation.[8]

A study by Goudelin et al. found that patients with WF had higher maximal E velocity suggesting abrupt increase in preload and afterload on SBT. Also, lower LVEF was present in the WF patients when compared to their WS counterpart.[41]

A study by Amarja et al. on the assessment of cardiac dysfunction brought on by the weaning process came to the conclusion that extubation failure can be predicted by preexisting poor LV systolic functions. Additionally, they found that a greater E/e' value after extubation were linked to a higher risk of reintubation.[105]

A recent metaanalysis by Sanfilippo et al. found that WF from MV was linked to worse LV diastolic function as documented by higher E/e' ratios, lower e' and higher E wave. The metaanalysis however could not elicit any correlation between WF and LVEF. Also, the study highlighted significant gaps regarding the association between WF and other echocardiographic parameters of LV systolic function and RV systolic function.[9]

A systemic review and metaanalysis by Almeida et al. evaluated LVDD as a predictor for WF. The study found that higher E/e` ratio significantly predicted WF.[51] Although a high heterogeneity of diastolic

dysfunction criteria and different clinical scenarios limited additional conclusions linking diastolic dysfunction with WF in this study.

A study by Moschietto et al. demonstrated that TTE can predict WF by estimating E/e'. The study found higher E/e' ratios in the failed group before and during SBT, with an optimal cut-off of 14.5 with a 75% sensitivity and 95.8% specificity to predict WF. The findings thus highlighted diastolic dysfunction with relaxation impairment as a key determinant of WF, in contrast to systolic function, which did not demonstrate a significant relationship.

A study by Mekontso et al. showed that LVEF did not differ significantly between WS and WF groups. The study concluded that congestive symptoms associated with WF were related to LVDD.[66]

A study conducted by Phillipe Vignon found that strategies to reduce LV overload, a primary cause of WIPO, can improve SBT success rates and extubation outcomes. The study concluded that TTE can identify high-risk patients and help the wean team by timely optimization of treatment modalities.[12]

A study by Caille et al. revealed that cardiac issues are major cause of WF. The study found that patients who failed weaning had a significantly lower LVEF at baseline and a shortened DCT, and increased E/e' ratio post weaning. The study thus concluded that TTE can identify high-risk patients prone to cardiac induced WF by identifying above parameters. However, to evaluate the impact of this screening method on weaning outcomes, more investigation is required.[13]

Consequently, the timing of weaning and an in-depth patient assessment prior to weaning is critical in order to minimize the risk of weaning and extubation failure. Incomplete patient assessment, premature weaning or delayed weaning in combination or alone can all lead to WF and increase the chances of extubation failure. A comprehensive patient assessment when coupled with a strategic plan to wean and extubate the patient yields enhanced patient outcomes, reduced hospital length of stay, and decreased healthcare expenditures.

Therefore, research has shown that there is a need for criteria that can help treating physicians decide whether to extubate a patient. Also, there is little research on weaning induced cardiac dysfunction in general ICU population in India. In ICUs, PS with PEEP is the most commonly used weaning technique. Heart lung interactions during weaning can result in cardiac dysfunction, which impacts extubation outcomes. The research of cardiac dysfunction brought on by weaning is relevant and suitable given the rise in the prevalence of cardiac comorbidities and the ageing population. Thus, the current study aims to determine whether WF in the general ICU population may be predicted by evaluating and identifying cardiac dysfunction that is present during the weaning procedure.

SUMMARY AND RATIONALE OF CURRENT STUDY

The pathophysiology of Weaning failure is complex and multifactorial. Systemic or multi-systemic involvement of different organ systems like respiratory, cardiac, endocrine, metabolic, hematopoietic, nutritional, neuromuscular, septic, complications of sepsis etc. lead to difficult weaning. The most common cause of weaning failure is respiratory but cardiac dysfunction in itself is a predictor of weaning failure. The cardiopulmonary interactions induced by mechanical ventilation during the weaning process are complex and are associated with changes in hemodynamics. The hemodynamic responses to weaning include cardiovascular dysfunction, autonomic alteration, cardiac dysrhythmias, and myocardial ischemia. Among cardiac dysfunction, there is substantial evidence that LV systolic and diastolic dysfunction leads to difficult weaning. However, there is paucity of literature on the dysfunction of the right ventricle as a contributing factor to weaning failure.

MATERIAL AND METHODS

SOURCE OF DATA:

Study design: Prospective observational study

Study place: Intensive care units, Dayanand Medical College, Ludhiana

Duration of the Study: August 2022-September 2024

METHOD OF COLLECTION OF DATA

INCLUSION CRITERIA:

- Patients admitted to ICU on mechanical ventilation
- Aged 18-70 years

EXCLUSION CRITERIA:

- Patients with preexisting cardiac diseases
- Inability to obtain clear TTE images
- Tracheostomized patients
- Pregnant patients
- Refusal to participate

STUDY PROTOCOL:

This was a prospective, observational study that was conducted in the ICU units of DMCH Ludhiana. The study was performed on 150 patients admitted to ICU and on Mechanical ventilation. Patients were enrolled and included, after obtaining informed and written consent from patients or legally acceptable representatives. After resolution of the primary pathology patients were taken up for weaning. The convenience sampling method was used for patient selection. Demographic (age, gender, comorbidities) and morphometric (height, weight) characteristics of participating patients were recorded. Additional data collection including pre-SBT arterial blood gas analysis, ventilator duration at SBT and weaning parameters like respiratory rate, tidal volume, rapid shallow breathing index, pressure support, fraction of inspired oxygen (FiO2), positive end expiratory pressure (PEEP), PaO2/FiO2 were recorded. Nutritional assessment was done using subjective global assessment. Any use of neuromuscular blocking drugs or steroids was noted. Systemic comorbidities, including

cardiac, respiratory, renal, and electrolyte abnormalities were also documented. Cumulative fluid balance for last three days before extubation was recorded. Total duration of mechanical ventilation, length of ICU stay was recorded.

Weaning method used in the study was PS with PEEP with automatic tube compensation. After successful completion of SBT by PS with PEEP as per the ICU protocol, patients planned for extubation based on treating physician's decision were included in the study. Baseline TTE assessment was done by trained echocardiographers before initiating a SBT. Post SBT TTE assessment was also done and recorded. All measurements were performed by single individual to avoid inter-observer bias. An average of three recordings over five minutes were taken to avoid intra- observer bias. The extubation was performed after the collection of parameters. Weaning failure was defined as patients who failed to pass SBT, or required reintubation within next 48 hours. TTE was also done and recorded for patients who were reintubated within 48 hours. The primary outcome of the study was to assess the incidence of left ventricular and right ventricular dysfunction in patients with weaning failure. Secondary outcomes that were assessed include the effects of cardiovascular dysfunction on the duration of mechanical ventilation and ICU length of stay. Other causes of weaning failure were also evaluated along the secondary outcome.

Echocardiographic measurements: All measurements were done using a Sonosite™ Edge portable machine with a 2-2.5 MHz phased array probe and inbuilt cardiac calculation software. LV systolic function was assessed qualitatively by visual gestalt method taking into account LV size, contractility and thickening of the various segments and classified into normal, mild, moderate and severe LV dysfunction. LV diastolic dysfunction was assessed by trans mitral flow velocity. Early filling velocity (E), late filling velocity (A) and deceleration time (DCT) were measured and recorded. Assessment of mitral annular flow velocity was done using tissue doppler imaging at the septal mitral annulus. E` and A` were measured. In patients having RWMA, both septal and lateral mitral leaflet velocities were measured and averaged to account

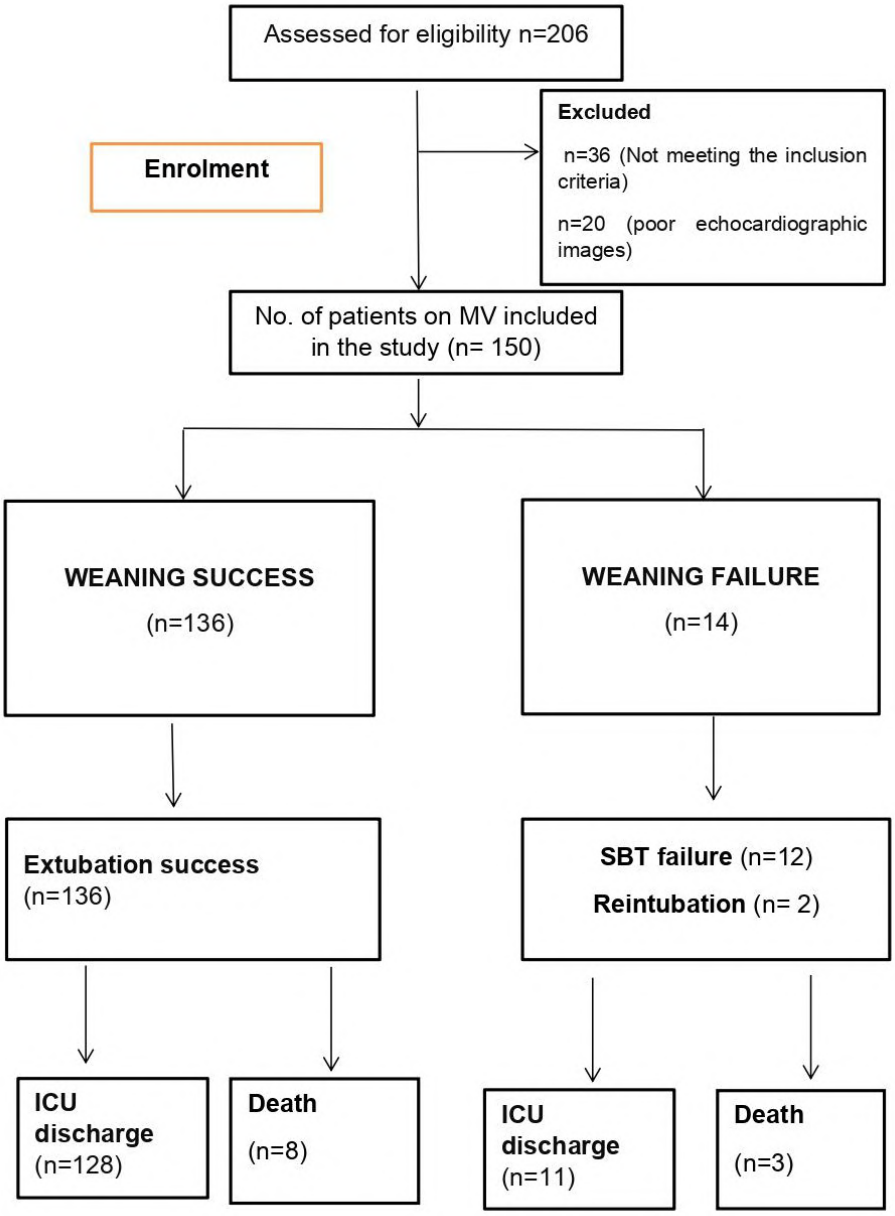
for potential variations in myocardial function. E/A, E/e` were calculated. Then based on mitral inflow and TDI parameters, according to the simplified definition patients were categorized into four grades of left ventricular diastolic dysfunction: grade 0 or normal, grade 1 diastolic dysfunction, grade 2 diastolic dysfunction and grade 3 diastolic dysfunction. The RV systolic function was assessed using tricuspid annular plane systolic excursion. RV dysfunction was defined as TAPSE of less than 17 mm. Inferior vena cava (IVC) diameter was also measured in M-mode echocardiography in the subcostal view. Both maximum and minimum diameter of the IVC were recorded. The IVC collapsibility index and IVC distensibility index were also calculated. Patients were followed up until discharge from ICU and any need for reintubation was also recorded.

STATISTICAL ANALYSIS

Prevalence of LV dysfunction is 9.94%.[52] Based on this, sample size (n) was calculated using formula $n= (Z^2\alpha \times P \times (1-P))/d^2$ Where; Zα = Value of standard normal variate corresponding to α level of significance, P = Likely value of parameter, Q = 1 – P, d = Margin of errors which is a measure of precision. Assuming the Confidence Level = 95% and Precision (d) = ± 5% the sample size works out as 138. 150 patients thus were included in this study to increase the power of the study. The Data collected was described in terms of range; mean ± standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. To determine whether the data were normally distributed, a Kolmogorov-Smirnov test was used. Comparison of quantitative variables between the study groups was done using Mann Whitney *U* test for independent samples for nonparametric data. Comparison of quantitative variables was done using Wilcoxon rank test. For comparing categorical data, Chi square (χ2) test was performed and fisher exact test was used when the expected frequency was less than five. A probability value (*p* value) of less than 0.05 was considered as statistically significant. All statistical calculations were done using (Statistical Package for the Social

Science) SPSS 21.0 version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

Figure .9 CONSORT DIAGRAM SHOWING PATIENT SELECTION AND RANDOMIZATION



Data depicted as n= number

OBSERVATIONS AND RESULTS

A total number of 206 patients admitted to the ICU units of the hospital were screened for eligibility. Out of 206 patients screened, 36 patients were not recruitable based on inclusion and exclusion criteria. In 20 patient's adequate echocardiographic images were not obtained and so they were also excluded from the study. 150 patients were thus analysed during the study period. There were 99 males and 51 females in the study population.

PATIENT CHARACTERSTICS

1. Age distribution (years)

Analysis of age demographics revealed a mean (mean ± S.D) age of 44.93 ± 15.55 years. The mean age in WS group was 44.16 ± 15.18 years, compared to 51.14 ± 16.13 years in the WF group. Although there is a noticeable difference in age, with older patients more likely to experience WF, the p-value of 0.105 indicates that this difference is not statistically significant. Therefore, while age may play a role, it is not a definitive predictor of WF in this sample.

Table 2: Mean (mean ± S.D) age of the sample population, and in WS and WF group

	Age	p value
Mean age in sample n=150	44.93 ± 15.55 years	p=0.105
Mean age in WS group	44.16 ± 15.18 years	
Mean age in WF group	51.14 ± 16.13 years	

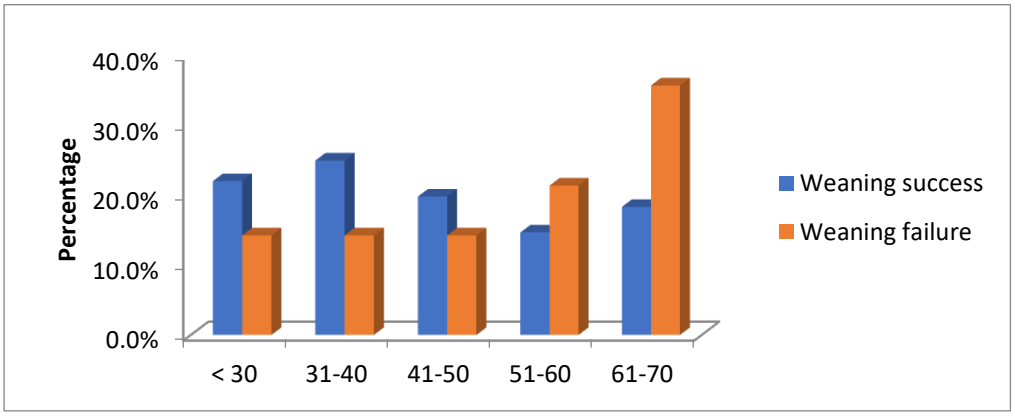
Further stratification of age groups demonstrated varied distributions between WS and WF groups (Table 3, Figure 10). Notably, the WS group had a higher proportion of patients in 31-40 years of age group (25.8% vs 14.3%), while the WF group showed a greater percentage of patients in 61-70 years of age group (35.7% vs 18.4%). The age group 41-50 years showed a slight difference in both groups, while the 51-60 age group was more prevalent in the WF group (21.4% vs 14.7% in WS group).

Table 3: Age Distribution across WS and WF Groups

Despite the observed variations, chi-square analysis did not indicate a statistically significant difference in overall age distribution between the groups (χ^2=3.451, p=0.485).

Age group	WS n=number (%)	WF n=number (%)	p value
<30	30 (22.1%)	2 (14.3%)	0.485
31-40	34 (25.0%)	2 (14.3%)	
41-50	27 (19.9%)	2 (14.3%)	
51-60	20 (14.7%)	3 (21.4%)	
61-70	25 (18.4%)	5 (35.7%)	

Figure 10: Bar graph depicting age distribution across WS and WF groups



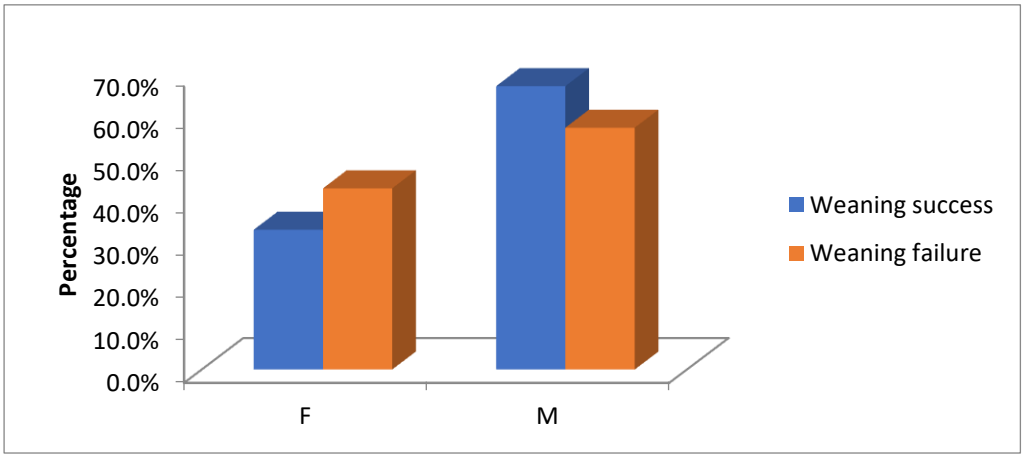
2. Gender distribution

Among 99 male patients, 91 (66.9% of the total group) succeeded in weaning, and 8 (57.1% of males) faced failure. Out of 51 female patients, 45 (33.1% of the total group) successfully weaned off, while 6 (42.9%) experienced WF. Although proportionally, a higher percentage of females (42.9%) failed weaning compared to males (57.1% success), the Chi-square value of 0.707 and the p-value of 0.702 suggest that these differences are not statistically significant. This indicates that the variation in weaning outcomes between male and female patients could have occurred by chance, and there is no clear evidence of gender playing a significant role in determining WS or WF.

Table 4: Gender Distribution across WS and WF Groups

Gender	WS	WF	Total	p value
Male	91 (66.9%)	8 (57.1%)	99 (66.0%)	0.702
Female	45 (33.1%)	6 (42.9%)	51 (34.0%)	

Figure 11: Bar graph depicting gender distribution across WS and WF groups



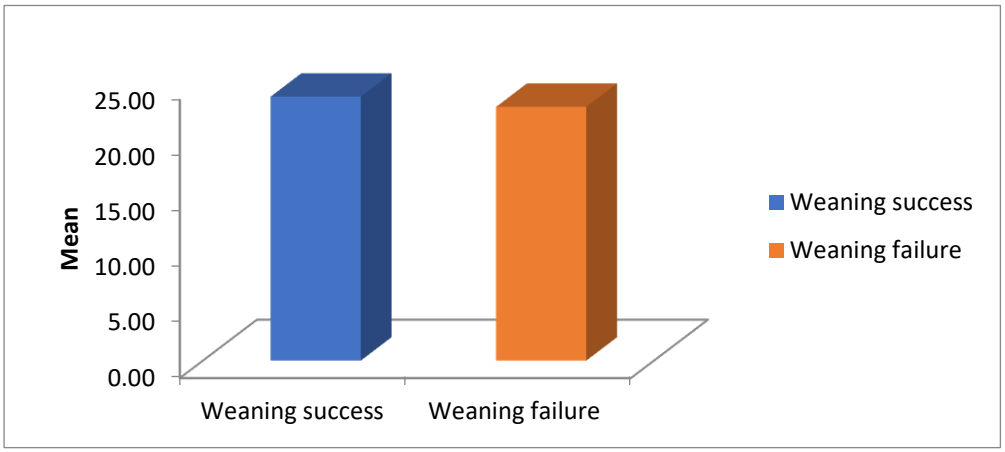
3. BMI and weaning outcomes

Table 5: BMI Distribution across WS and WF Groups

	WS	WF	p value
BMI kg/m^2 (mean ± S.D)	23.72 ± 3.66	22.80 ± 2.47	0.410

The WS group had a mean BMI of 23.72 ± 3.66 while the WF group, had a mean BMI of 22.80 ± 2.47. The Z-value of -0.82 and p-value of 0.410 suggest that the difference in BMI between the two groups is not statistically significant.

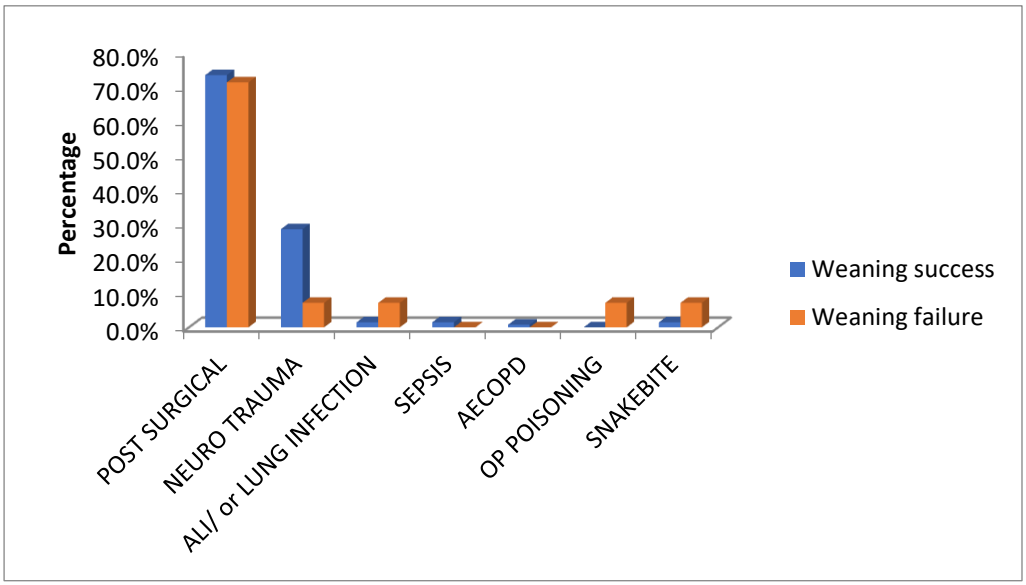
Figure 12: Bar graph depicting BMI across WS and WF groups



4. Reason for ICU admission

The main conditions associated with MV in this study were postsurgical, neuro trauma, acute lung injury, lung infections, and sepsis. A few cases of organophosphorus poisoning, snake bite were also included.

Figure 13: Bar diagram showing various pathologies for ICU admission among the general population.



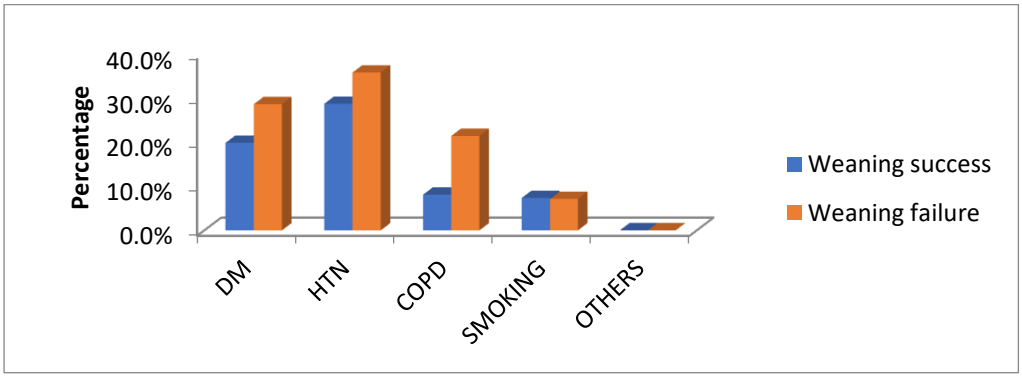
5. Comorbidities and weaning outcomes

The below table highlights the relationship between common comorbidities and weaning outcomes in mechanically ventilated patients. It reveals important differences between those who successfully weaned from the ventilator and those who experienced WF.

Table 6: Comorbidities and their distribution across WS and WF Groups

Comorbidities	WS n=number (%)	WF n=number (%)	Total n=number (%)	p value
DM	27 (19.9%)	4 (28.6%)	31 (20.7%)	0.489
HTN	39 (28.7%)	5 (35.7%)	44 (29.3%)	
COPD	11 (8.1%)	3 (21.4%)	14 (9.3%)	
SMOKING	10 (7.4%)	1 (7.1%)	11 (7.3%)	

Figure 14: Bar graph depicting various comorbidities across WS and WF groups



Comorbidities such as diabetes, hypertension, and particularly COPD appear to play a role in increasing the likelihood of WF from MV. They are present with increased prevalence in the failure group. Overall, none of the comorbidities showed a statistically significant relationship with WF based on the p-values.

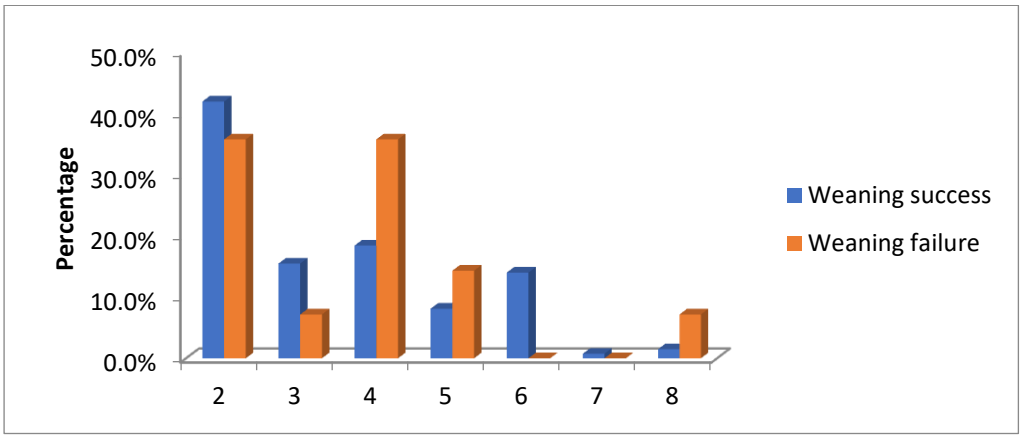
6. SOFA Score and weaning outcomes

From the data, it's clear that the majority of successful weaning occurred in patients with lower SOFA scores, particularly those with a score of 2, where 57 out of 136 total successes are concentrated (41.9%). This suggests that patients with relatively lower organ dysfunction have a much higher likelihood of successfully weaning. However, even among patients with a SOFA score of 2, there are still some failures (5 cases), comprising 35.7% of the total failures, indicating that even relatively stable patients can encounter difficulties. There is the inverse relationship between SOFA scores and weaning success, with lower scores being more favourable for successful weaning outcomes.

Table 7: Mean SOFA score and their Distribution across WS and WF Groups

SOFA Score preSBT	WS n=number (%)	WF n=number (%)	Total n=number (%)	p value
2	57 (41.9%)	5 (35.7%)	62 (41.3%)	0.295
3	21 (15.4%)	1 (7.1%)	22 (14.7%)	
4	25 (18.4%)	5 (35.7%)	30 (20.0%)	
5	11 (8.1%)	2 (14.3%)	13 (8.7%)	
6	19 (14.0%)	0 (0.0%)	19 (12.7%)	
7	1 (0.7%)	0 (0.0%)	1 (0.7%)	
8	2 (1.5%)	1 (7.1%)	3 (2.0%)	

Figure 15: Bar graph depicting mean SOFA Scores across WS and WF groups



A p-value of 0.295 is above the threshold of 0.05, indicating that the results are not statistically significant. This means that, while the data shows trends between SOFA scores and WS or WF, the statistical analysis suggests that these differences could be due to chance, and there is no strong evidence of a definitive relationship between the SOFA score and weaning outcomes based on this analysis.

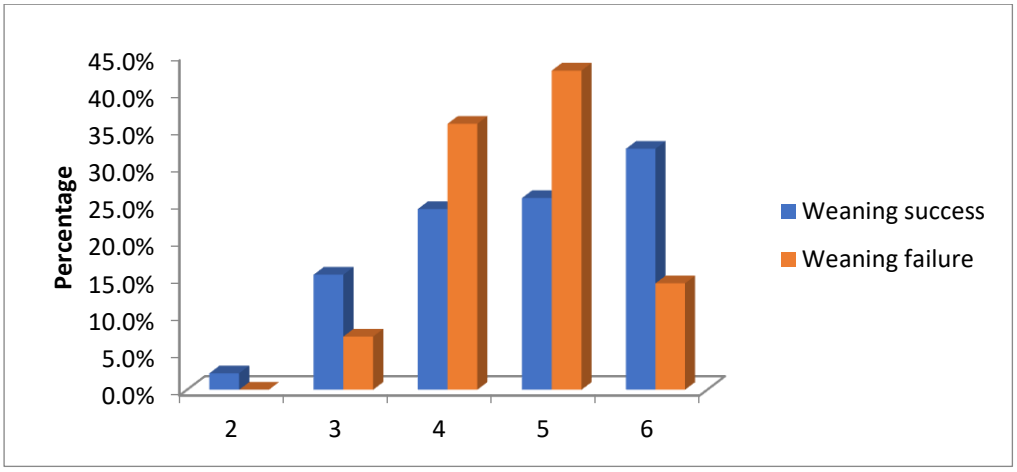
7. **SGA score and weaning outcomes**.

The below table presents the distribution of WS and WF across different SGA score levels, ranging from 2 to 6. The chi-square value and p-value indicate that the relationship between SGA scores and weaning outcomes in this dataset is not statistically significant, meaning the observed differences between success and failure across score levels may be due to chance rather than a clear trend.

Table 8: Mean SGA score and their Distribution across WS and WF Groups

SGA Score	WS n=number (%)	WF n=number (%)	Total n=number (%)	p value
2	3 (2.2%)	0 (0.0%)	3 (2.0%)	
3	21 (15.4%)	1 (7.1%)	22 (14.7%)	
4	33 (24.3%)	5 (35.7%)	38 (25.3%)	0.370
5	35 (25.7%)	6 (42.9%)	41 (27.3%)	
6	44 (32.4%)	2 (14.3%)	46 (30.7%)	

Figure 16: Bar graph depicting SGA Scores across WS and WF groups



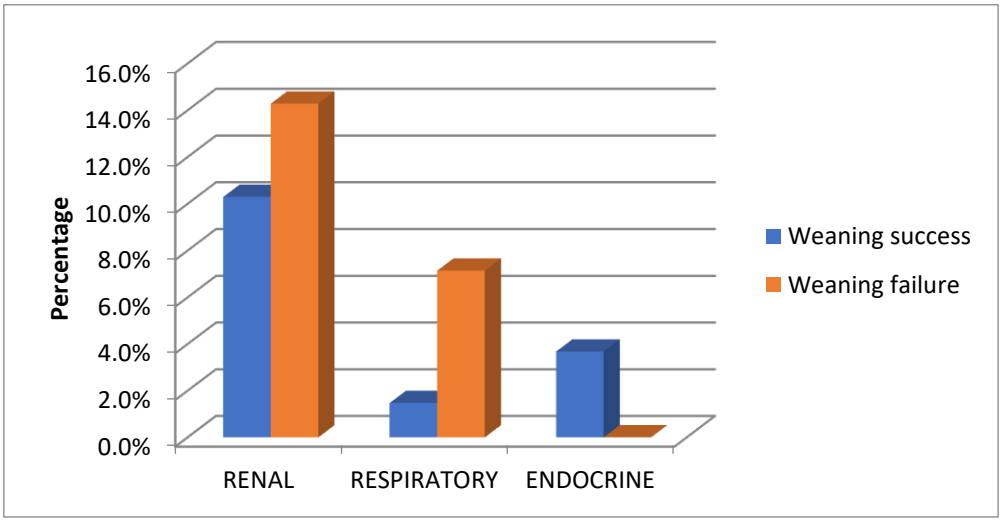
8. Systemic diseases and weaning outcomes

The analysis of weaning outcomes in patients with systemic diseases reveals a complex interplay between underlying health conditions and success rates as depicted by below table.

Table 9: Systemic diseases and their Distribution across WS and WF Groups

Systemic Diseases	WS n=number (%)	WF n=number (%)	Total n=number (%)	p value
Renal	14 (10.3%)	2 (14.3%)	16 (10.7%)	0.647
Respiratory	2 (1.5%)	1 (7.1%)	3 (2.0%)	0.256
Endocrine	5 (3.7%)	0 (0.0%)	5 (3.3%)	0.466

Figure 17: Bar graph depicting systemic diseases across WS and WF groups



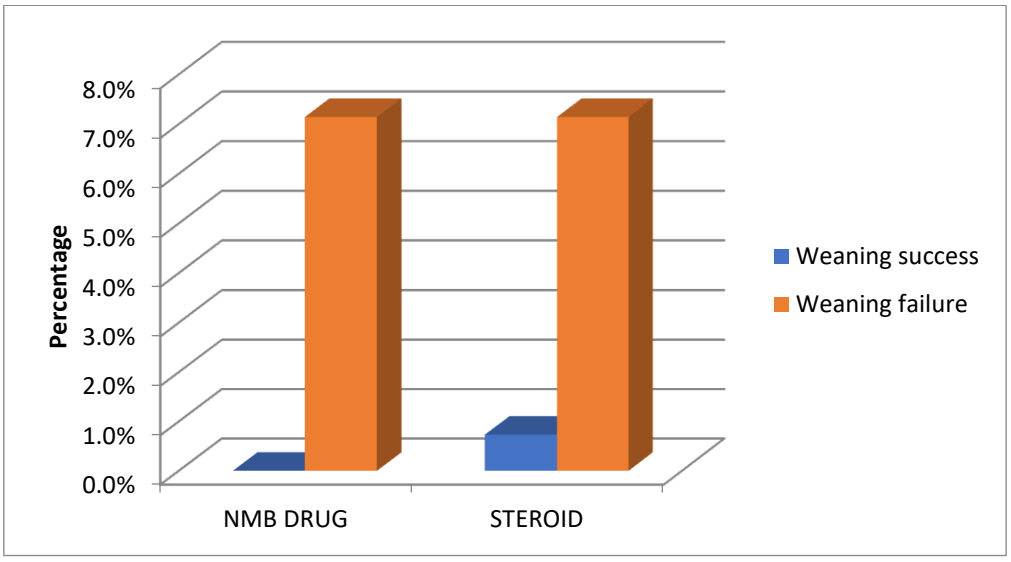
9. Use of neuromuscular blockers drugs and steroids and associated weaning outcomes

The below table represents the impact of neuromuscular blocking drugs and steroids on WS and WF in 150 patients. The overall total for the population shows that 98% of the patients had no use of NMB drugs or steroids, and only 2% of the population was exposed to them. This data suggests that not using these drugs may be more effective for weaning success as the values are significant. (P<0.001)

Table 10: NMB drugs and steroids and their Distribution across WS and WF Groups

NMB drug/ Steroids	WS n=number (%)	WF n=number (%)	Total n=number (%)	p value
NMB drug	0 (0.0%)	1 (7.1%)	1 (0.7%)	0.001
Steroid	1 (0.7%)	1 (7.1%)	2 (1.3%)	

Figure 18: Bar graph depicting use of NMB drugs/steroids across WS and WF groups



BASELINE PARAMETERS

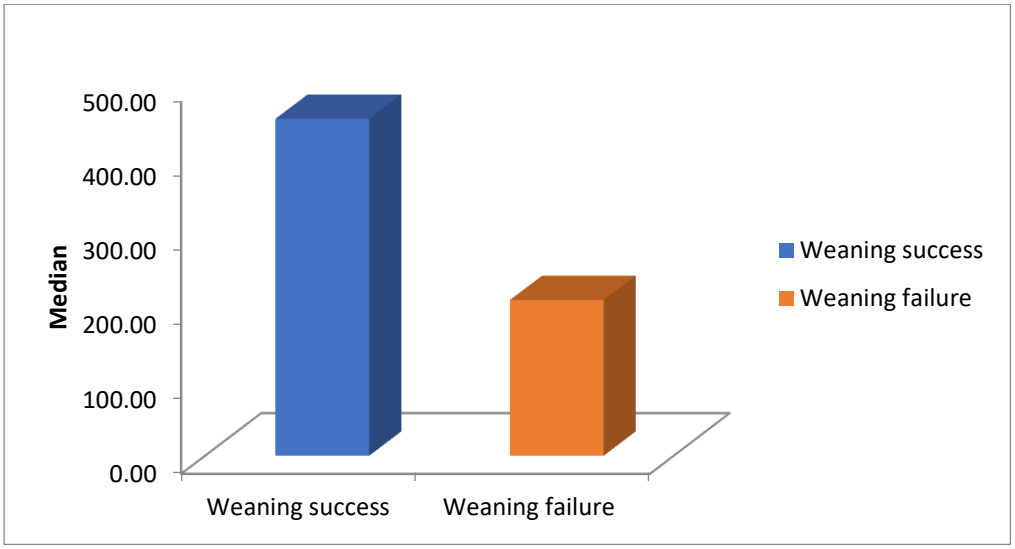
1. **Cumulative fluid balance preSBT across patients with WF and WS group.**

The median (IQR) cumulative fluid balance preSBT in the WF group was 955 ml (-209-2144) in comparison to the WS group where the median cumulative balance was 1045 ml (453-1682).

Table 11: Cumulative fluid balance preSBT as expressed in median, Interquartile range (IQR)

Parameter	WS	WF
Cumulative fluid balance (ml) Median, Interquartile range (IQR)	1045 (453-1682)	955 (-209-2144)

Figure 19: Bar graph depicting cumulative fluid balance in median (IQR) across WS and WF groups



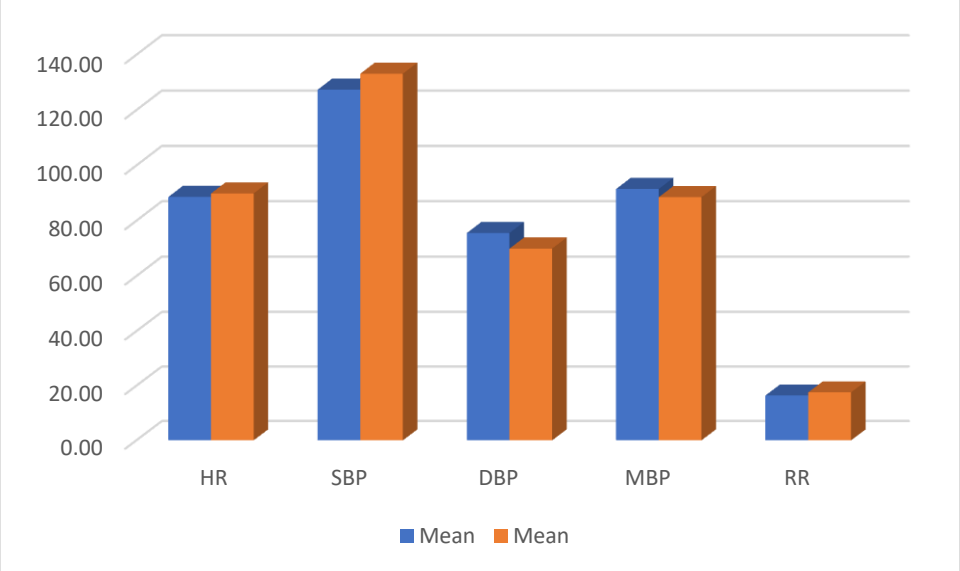
2. Baseline hemodynamic preSBT in WS and WF group

The baseline hemodynamics were insignificant between the two groups as shown by P value > 0.05. Also, the baseline hemodynamics were consistent with initiation of the weaning process.

Table 12: Baseline hemodynamic preSBT among WS and WF group

Parameter (Mean ± S.D)	WS	WF	p value
HR	88.60 ± 16.74	88.60 ± 16.74	0.766
SBP	127.3 ± 16.02	127.3 ± 16.02	0.730
DBP	75.55 ± 11.90	75.55 ± 11.90	0.059
MBP	91.47 ± 12.23	91.47 ± 12.23	0.229
RR	16.53 ± 2.22	16.53 ± 2.22	0.375

Figure 20: Bar graph depicting baseline hemodynamic preSBT across WS and WF groups



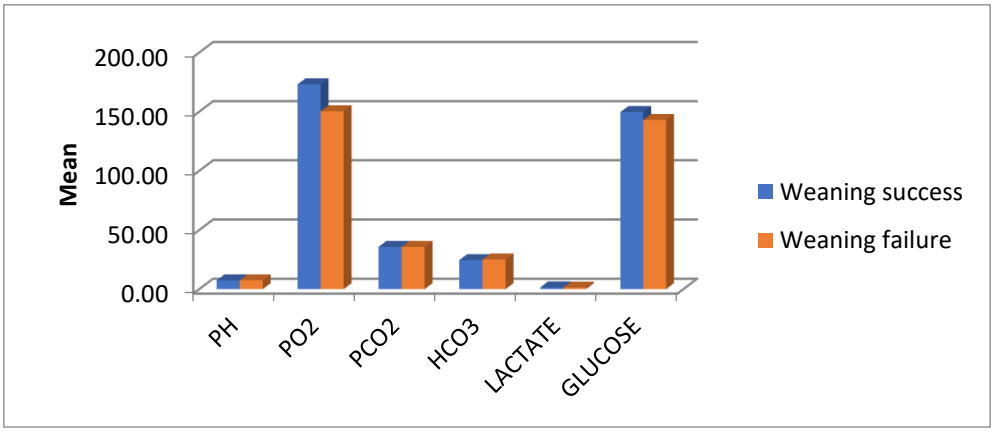
3. Baseline arterial blood gas analysis preSBT in WS and WF group

The baseline arterial blood gas parameters were insignificant between the two groups as shown by P value > 0.05. Also, the baseline parameters were consistent with initiation of the weaning process.

Table 13: Baseline ABG preSBT among WS and WF group

Parameter (mean ± S.D)	WS	WF	P value
Ph	7.43 ± 0.06	7.44 ± 0.09	0.565
Po_2	170.96 ± 51.53	150.29 ± 45.04	0.148
Pco_2	35.65 ± 4.72	35.57 ± 4.43	0.925
Hco_3	24.57 ± 4.39	25.01 ± 4.28	0.660
Lactate	1.41 ± 0.72	1.3 ± 0.75	0.587
Glucose	148.99 ± 46.34	142.93 ± 39.01	0.752

Figure 21: Bar graph depicting baseline ABG parameters preSBT across WS and WF groups



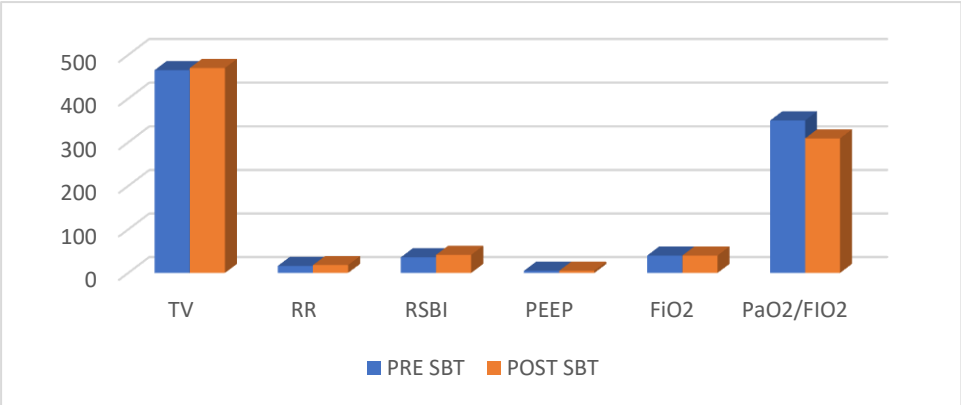
4. Ventilator parameters preSBT and postSBT and their correlation in patients with WF and WS.

PreSBT patients had slightly lower TV (465 vs. 470), lower RR (16 vs. 19), and lower RSBI scores (36 vs. 44) when compared to postSBT values. PEEP levels and FiO2 was similar both pre and postSBT. PaO2/FiO2 ratio was nearly equal in the successful group (350 vs. 346). The values for all ventilator parameters pre and postSBT were insignificant with p values > 0.05. The preSbt values were consistent with the initiation of weaning.

Table 14: Comparison of Ventilator parameters pre and postSBT.

Ventilator parameters (mean ± S.D)	preSBT	postSBT
TV	465 ± 38	470 ± 109
RR	16 ± 2.59	18 ± 4.68
RSBI	36 ± 5.95	41.60 ± 17.21
PEEP	5 ± 0.12	5 ± 0.00
FiO2	40 ± 0.96	40 ± 0.00
PaO2/FIO2	350 ± 108	309 ± 91

Figure 22: Bar graph depicting ventilator parameters preSBT across WS and WF groups



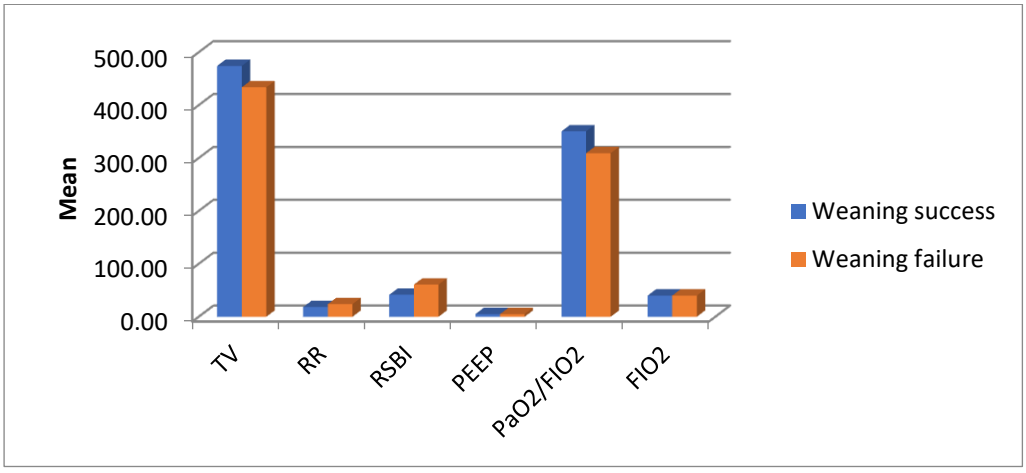
4b. Comparison of ventilator parameters between patients in WS and WF group postSBT

Patients with successful weaning had slightly higher preSBT TV (475 vs. 434), lower RR (19 vs. 24), and lower RSBI scores (41 vs. 60). FiO2 and PEEP levels were similar in both the groups, but the PaO2/FiO2 ratio was higher in the successful group (350 vs. 309). The values for all ventilator parameters in WS and WF group were insignificant (p values > 0.05) except for RR and RSBI which was significantly higher (p values < 0.05) in the WF group but their values were well below the criteria for weaning in ICU.

Table 15: Comparison of ventilator parameters between patients in WS and WF group postSBT.

Ventilator parameters postSBT (mean ± S.D)	WS	WF	P value
TV	475 ± 109	434 ± 95	0.346
RR	19 ± 4.68	24 ± 8.48	0.012
RSBI	41 ± 17.21	60 ± 31.43	0.036
PS	4.43 ± 4.59	6.07 ± 4.55	0.143
PEEP	5 ± 0.27	5 ± 0.00	0.649
FiO_2	40 ± 1.22	40 ± 0.00	1
PaO_2/FIO_2	350	309	0.198

Figure 23: Bar graph comparing ventilator parameters postSBT and among WS and WF groups



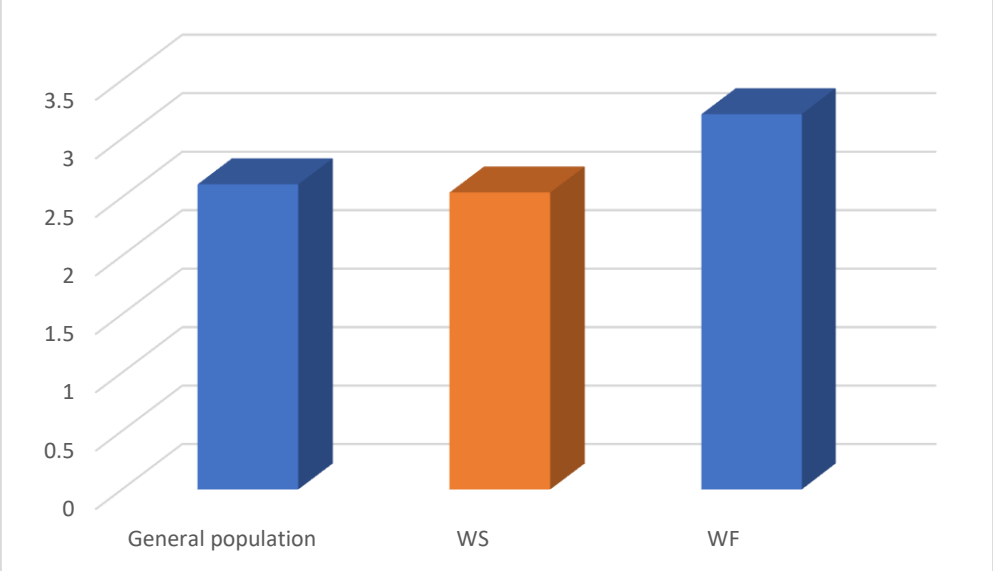
5. Duration of MV preSBT

The mean duration of MV preSBT was 2.61 ± 1.85 days in the population sample. The mean duration of MV preSBT in WS and WF groups were comparable with 2.54 ± 1.82 days in WS and 3.21 ± 2.12 days in WF group (p value=0.143).

Table 16: Comparison of mean duration of ventilator days preSBT in the general population and among the WF and WS groups.

Parameter	General population	WS	WF	p value
Mean (mean ± S.D) duration of MV preSBT	2.61 ± 1.85 days	2.54 ± 1.82 days	3.21 ± 2.12 days	0.143

Figure 24: Bar graph comparing mean duration of ventilator days preSBT in the general population and among the WF and WS groups



ECHO ASSESSMENT

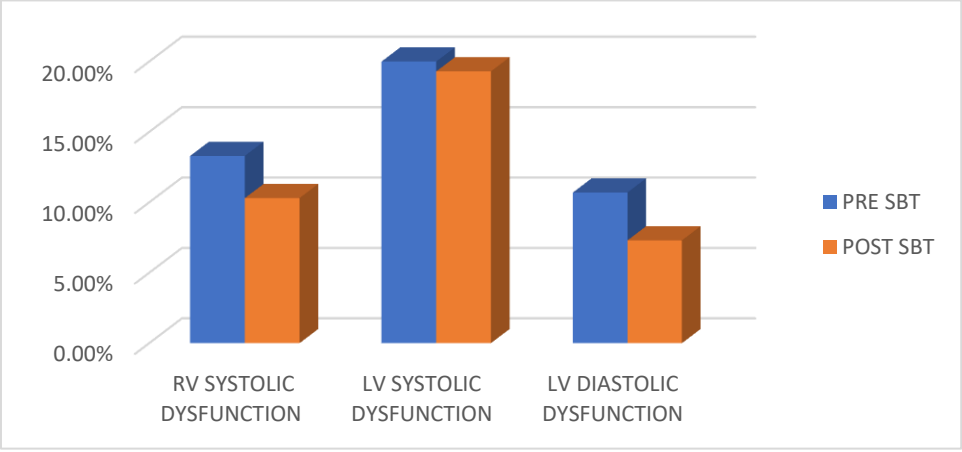
1. **Prevalence rates of RV systolic, LV systolic and LV diastolic dysfunction preSbt and postSBT.**

The echocardiogram assessment data reveals the prevalence of different cardiac dysfunctions before and after SBT. PreSBT, the rates of RV systolic dysfunction, LV systolic dysfunction, and LVDD were 13.30%, 20.00%, and 10.70%, respectively. After the SBT, these rates decreased to 10.30% for RV systolic dysfunction, 19.30% for LV systolic dysfunction, and 7.30% for LVDD. Also, patients with decreased EF or patients with LV systolic dysfunction demonstrated a substantial overlap with RV systolic dysfunction, with prevalence rates of 13.3% pre-SBT and 10.3% post-SBT.

Table 17: Prevalence rates of RV systolic, LV systolic and LVDD preSbt and postSBT.

Prevalence rates	preSBT	postSBT
RV systolic dysfunction	13.30%	10.30%
LV systolic dysfunction	20%	19.30%
LV diastolic dysfunction	10.7%	7.3%

Figure 25: Bar graph depicting prevalence rates of RV systolic, LV systolic and LVDD pre and postSBT



2. Association of RV systolic dysfunction with LV systolic dysfunction

2a.) The onset of new RV systolic dysfunction associated with LV systolic dysfunction in our study was 7.1% and this was statistically significant. P value <0.05.

Table 18: Incidence of new RV systolic dysfunction

		WS n=number (%)	WF n=number (%)	p value
New RV systolic dysfunction	No	132 (97.1%)	13 (92.9%)	0.036
	Yes	4 (2.9%)	1 (7.1%)	

2b.) Comparison of RV systolic dysfunction in patients with various grades of LV systolic dysfunction preSBT and PostSBT

The data analysis of patients as in both preSBT and postSBT reveals that significant number of patients with LV systolic dysfunction had coexisting RV systolic dysfunction with p values <0.05 preSBT and equal to 0.05 postSBT.

Table 19: Comparison of RV systolic dysfunction in patients with various grades of LV systolic dysfunction preSBT.

preSBT	LVEF	New RV systolic dysfunction		P value
		No	Yes	
LV systolic Dysfunction	Normal	119	1	0.036
	Mild	12	1	
	Moderate	6	1	
	Severe	8	2	

Table 20: Comparison of RV systolic dysfunction in patients with various grades of LV systolic dysfunction postSBT.

postsbt	LVEF	New RV systolic dysfunction		p value
		No	Yes	
LV systolic Dysfunction	Normal	119	2	0.050
	Mild	11	0	
	Moderate	4	1	
	severe	11	2	

3. New onset LV systolic dysfunction induced during the weaning process

The comparison in between patients for LV systolic dysfunction according to grading was not significant preSBT (p value=0.36) and postSBT (p value=0.05). However, the proportion of patients with severe LV dysfunction significantly increased from 6.7% pre-SBT to 8.6% post-SBT, indicating a worsening of cardiac function during weaning. (P value=0.05)

Table 21: Comparison between different grades of LV systolic dysfunction and WF pre and postSBT

Parameter	Grade	n=number (%)	p value
LV systolic dysfunction preSBT	Mild	13 (8.6%)	0.036
	Moderate	7 (4.6%)	
	Severe	10 (6.7%)	
LV systolic dysfunction postSBT	Mild	11 (7.3%)	0.05
	Moderate	5 (3.3%)	
	severe	13 (8.6%)	

Figure 26: Bar graph depicting prevalence of LV systolic dysfunction preSBT.

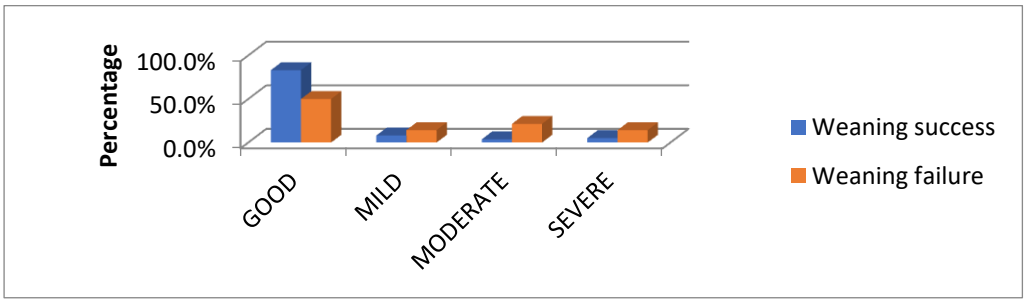
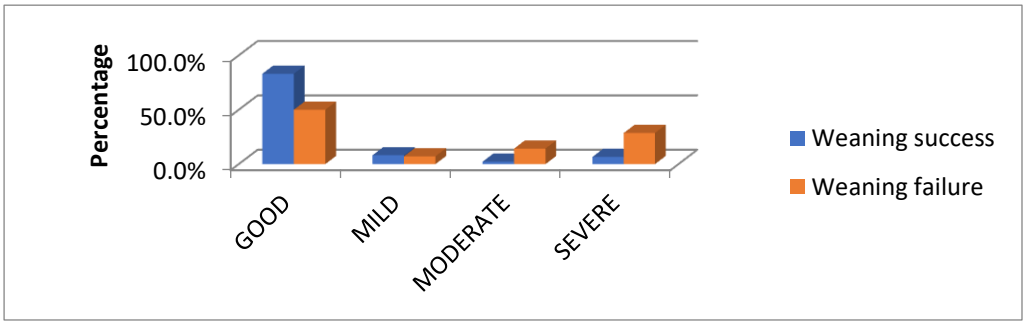


Figure 27: Bar graph depicting prevalence of LV systolic dysfunction postSBT.



4. Dysfunction of heart and WF across RV systolic, LV systolic and LV diastolic dysfunction

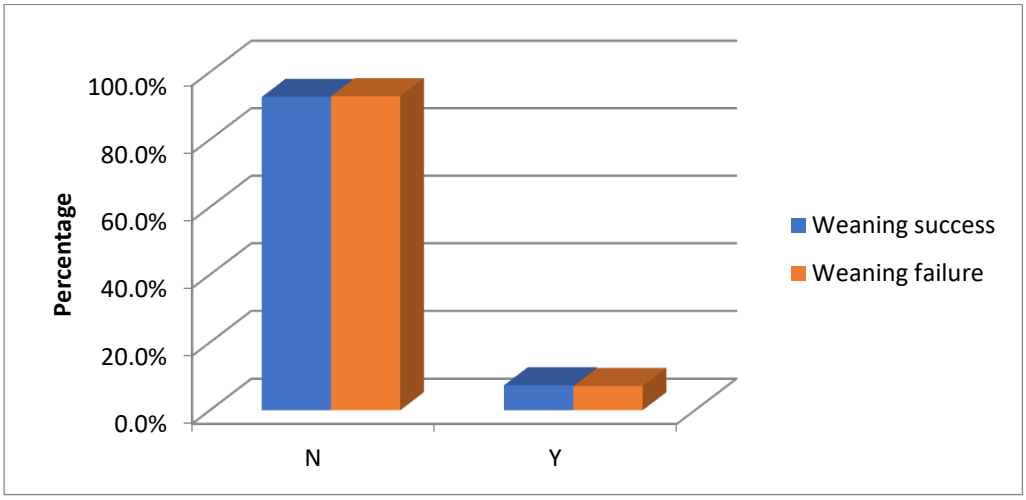
4a.) RV systolic dysfunction and WF

No significant correlation exists between RV systolic dysfunction and WF as depicted by data in table below.

Table 22: RV systolic Dysfunction and WF.

Parmeter	WS	WF	P VALUE
RV systolic dysfunction	10	0	0.599

Figure 28: Bar graph depicting RV systolic dysfunction and its association with WF and WS



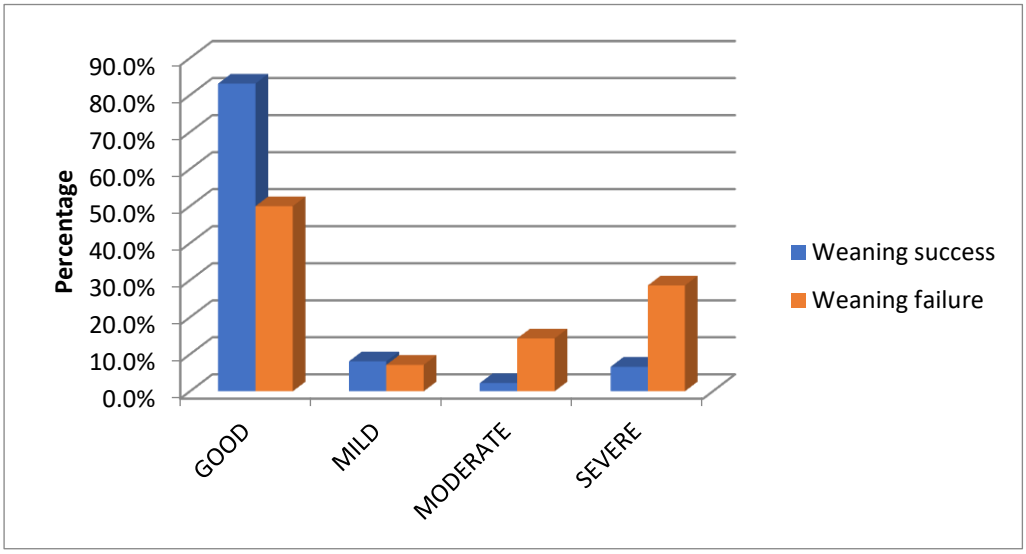
4b.) LV systolic dysfunction and WF

There is significant correlation between LV systolic dysfunction and WF as depicted by data in table below with p values <0.05. Also as the severity increases the WF rate also increase substantially indicating worse LVEF is associated with significant WF.

Table 23: LV systolic Dysfunction and WF across mild, moderate and severe categories.

Parmeter		WS n=number (%)	WF n=number (%)	p value
LV systolic dysfunction	Normal	114 (83.1%)	7 (50%)	0.02
	Mild	10 (8.1%)	1 (7.1%)	
	Moderate	3 (2.2%)	2 (14.3%)	
	Severe	9 (6.6%)	4 (28.6%)	

Figure 29: Bar graph depicting LVEF among WS and WF groups



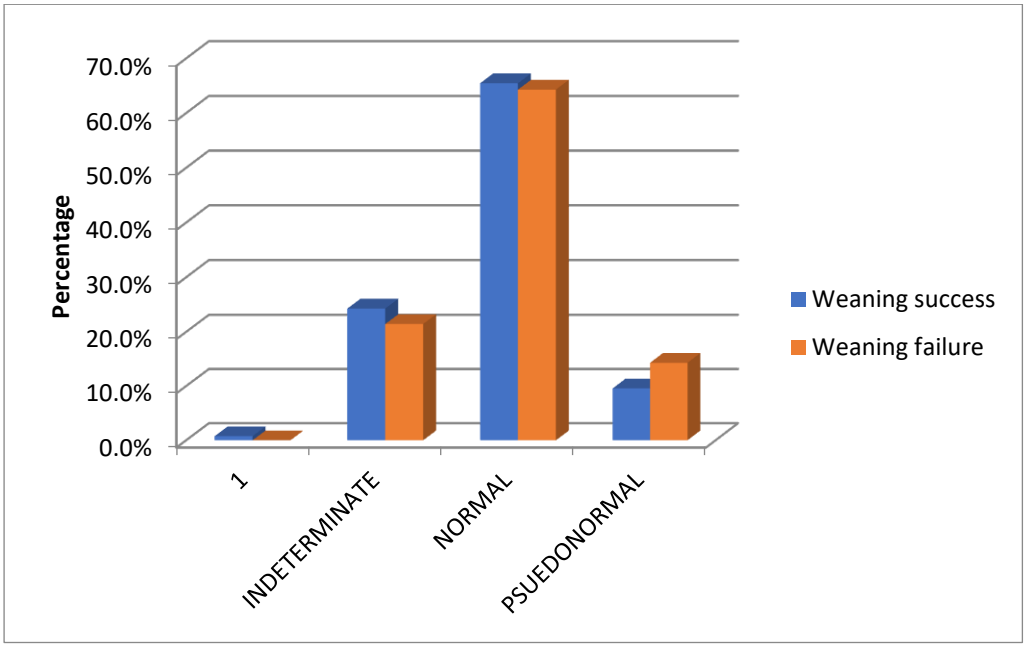
4c.) LVDD and WF

Any significant correlation between LVDD and WF could not be established (p values > 0.05). The absence of a universally accepted definition for LVDD complicated the data analysis in our study as most patients were classified as indeterminate.

Table 24: LVDD and its comparison among WF and WS groups.

Parmeter		WS n=number (%)	WF n=number (%)	p value
LV diastolic dysfunction	Normal	89 (65.4%)	9 (64.3%)	0.934
	Grade 1	1 (0.7%)	0 (0%)	
	Grade 2	13 (9.6%)	2 (14.3%)	
	Indeterminate	33 (24.3%)	4 (21.4%)	

Figure 30: Bar graph depicting grades of LVDD among WS and WF groups



(4d.) Comparison of various ECHO parameter pre and postSBT

The below table depicts the echo parameters pre and postSBT

Table 25: Comparison of various ECHO parameter pre and postSBT

Echo parameters	preSBT (mean ± S.D)	postSBT (mean ± S.D)	p value
E (cm/sec)	85.64 ±16.40	88.30 ± 19.63	0.039
A (cm/sec)	77.19 ± 17.89	78.40 ± 21.21	0.343
E/A	1.62 ± 5.71	1.17 ± 0.34	0.336
DCT	210 ± 45	204 ± 47	0.112
Lateral e'(cm/sec)	8.95 ± 2.61	10.29 ± 3.08	0.330
Lateral a'(cm/sec)	9.27 ± 1.77	10.48 ± 2.98	0.365
Septal e'(cm/sec)	11.76 ± 3.47	12.26 ± 3.55	0.015
Septal a'(cm/sec)	8.48 ± 1.63	9.01 ± 2.56	0.015
Average e'	7.94 ± 2.16	10.32 ± 3.89	0.135
Average a'	8.48 ± 1.63	9.81 ± 2.95	0.242
E/e'	7.69 ± 2.33	7.58 ± 2.45	0.519
TAPSE (cm/sec)	2 ± 0.27	2.04 ± 0.30	0.07
IVC max_{dia} (cm)	1.56 ± 0.38	1.51 ± 0.34	0.055
IVC min_{dia} (cm)	1.02 ± 0.37	0.96 ± 0.34	0.025
IVC compressibilty index	36.09 ± 11.85	37.63 ± 13.45	0.211
IVC distensibilty index	59.53 ± 33.17	68.50 ± 44.26	0.019

1. The mean E wave velocity increased slightly from 85.64 to 88.30 cm/sec, with a statistically significant p-value of 0.039.
2. The A wave increases from 77.19 to 78.40 cm/sec, but the p-value is 0.343, indicating that this change is not statistically significant.
3. The E/A ratio changes slightly from 1.62 to 1.17. However, the p-value of 0.343 indicates that this change is not statistically significant.
4. The DCT decreases from 210 ms to 203.97 ms, but the p-value of 0.112 suggests this is not a significant change.
5. The septal e' increases from 11.76 to 12.26 cm/sec, with a p-value of 0.015, suggesting a significant improvement in septal myocardial relaxation post-weaning.
6. The septal a' also rises significantly from 8.48 to 9.01 cm/sec, with a p-value of 0.028, reflecting enhanced atrial contraction.
7. The E/e' ratio remains almost the same (7.69 vs. 7.56), with a non-significant p-value of 0.519.
8. TAPSE showed a slight increase from 2 to 2.04 cm with a p-value of 0.07 and this is not statistically significant.
9. The maximal diameter of the IVC decreases slightly from 1.56 to 1.51 cm, with a non-significant p-value of 0.141, indicating no substantial change.
10. The minimal IVC diameter decreased from 1.02 to 0.96 cm, approaching significance with a p-value of 0.025.
11. There is a slight increase in IVC compressibility index from 36.09% to 37.63%, with a non-significant p-value of 0.211, showing no major change.
12. The IVC distensibility index increases from 59.53% to 68.50%, with a p-value of 0.019 which was significant.

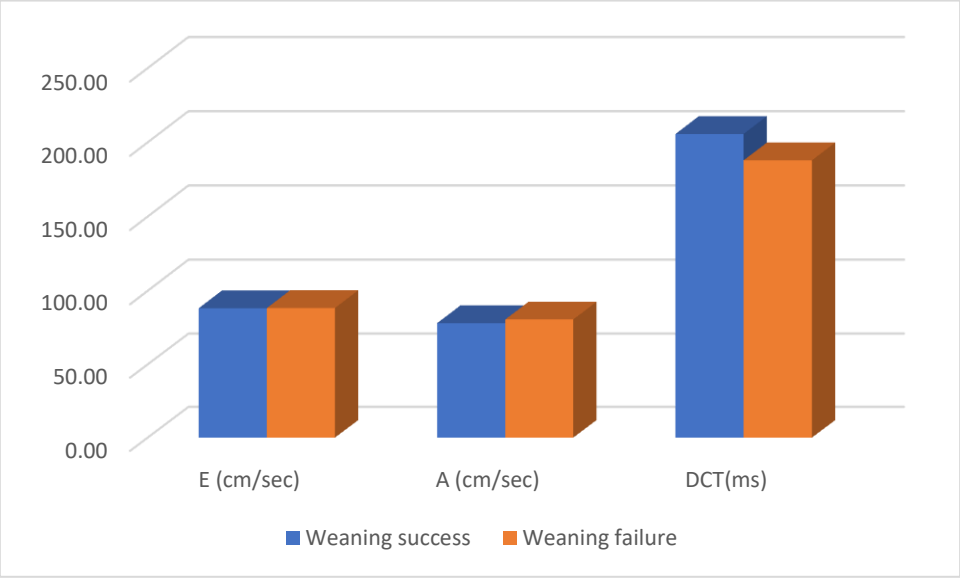
4e.) E wave, A wave, DCT) parameter in patients with WS and WF postSBT

No significant differences were observed in E (cm/sec), A (cm/sec), E/A ratio and DCT (ms) among patients with WS or WF (p values > 0.05).

Table 26: Comparison of E wave, A wave, DCT in patients with WS and WF postSBT

ECHO PARAMETERS	WS	WF
E (cm/sec)	85.32	88.70
A (cm/sec)	76.85	80.51
DCT	210	205

Figure 31: Bar graph depicting E wave, A wave, DCT in patients with WS and WF postSBT



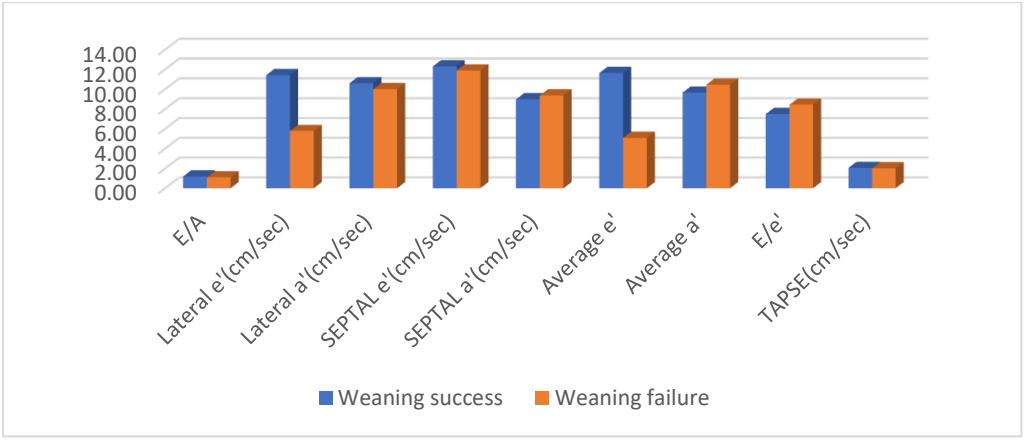
4f.) E/a, lateral e'and a', septal e' and a', average e' and a', E/e' ratio and TAPSE among patients with WS and WF postSBT.

No significant differences were observed in E/A ratio, lateral e' and a', septal e' and a', average e' and a'. The E/e' ratio was higher in patients with WF but was not significant (p=0.275). Also, TAPSE was slightly lower in the failure group but was nonsignificant (p=0.266). all other parameters noted were nonsignificant.

Table 27: Comparison of E/a, lateral e'and a', septal e' and a', average e' and a', E/e' ratio and TAPSE among patients with WS and WF postSBT.

Parameter (mean)	WS	WF
E/A	1.67	1.14
Lateral e'(cm/sec)	9.27	7.68
Lateral a'(cm/sec)	9.34	8.98
Septal e'(cm/sec)	11.82	11.17
Septal a'(cm/sec)	8.47	8.62
Average e'	7.88	6.38
Average a'	8.39	8.85
E/e'	7.62	8.34
TAPSE (cm/sec)	2.01	1.96

Figure 32: Bar graph depicting E/A ratio, lateral e' and a', septal e' and septal a', average e' and a', E/e' ratio and TAPSE in patients with WS and WF postSBT



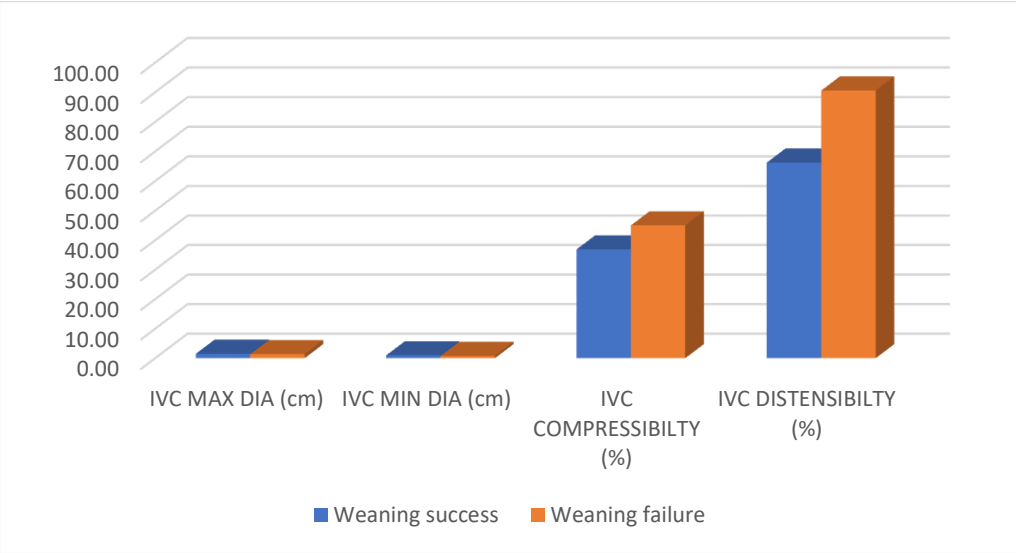
4g.) IVC diameters, IVC collapsibilty index, IVC distensibility index among WS and WF groups postSBT.

The $IVCmin_{dia}$ was significant between the two groups postSBT. (P=0.03) Other IVC parameters ($IVCmax_{dia}$, IVC compressibility and distensibility index were not significant between the two groups.

Table 28: Comparison of IVC diameters, IVC collapsibilty index, IVC distensibility index among WS and WF groups postSBT.

Parameter (mean ± S.D)	WS	WF	P value
IVC max_{dia} (cm)	1.52 ± 0.35	1.40 ± 0.25	0.139
IVC min_{dia} (cm)	0.97 ± 0.34	0.79 ± 0.29	0.03
IVC compressibilty index	36.87 ± 13.08	45.01 ± 15.21	0.065
IVC distensibilty index	66.23 ± 42.42	90.57± 56.45	0.168

Figure 33: Bar graph depicting IVC diameters, IVC collapsibilty index, IVC distensibility index among WS and WF groups postSBT.



5. Reasons for weaning failure

The most common reason for WF was severe left ventricular systolic dysfunction (LV dysfunction), accounting for 28.6% (4 out of 14) of failures. Other reasons included increased respiratory rate (RR) in 14.3%, and less frequent issues like altered sensorium, fluid overload, increased heart rate, intermediate syndrome associated with OP poisoning in one patient, moderate LV dysfunction, and respiratory issues, each contributing 7.1% to failure.

6. Reintubation

Two patients out of fourteen in the WF group required reintubation.

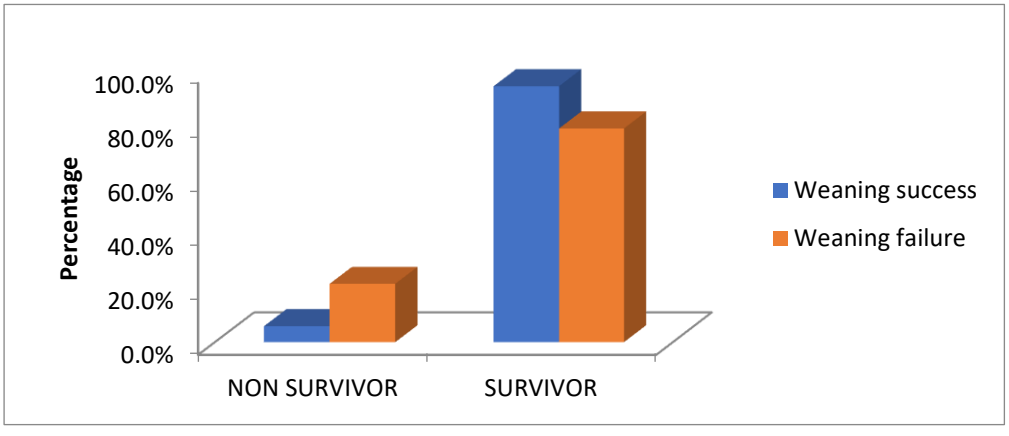
7. 28 Day outcome

The analysis of the 28-day outcome in relation to weaning failure reveals important insights into patient survival. Out of 150 patients, 11 were classified as non-survivors, with 3 of them experiencing weaning failure (21.4%), while only 8 non-survivors did not fail weaning (5.9%).

Table 29: 28 day outcome in patients with WS and WF

28 day outcome	WS	WF	Total
Non-survivor	8 (5.9%)	3 (21.4%)	11 (7.3%)
Survivor	128 (94.1%)	11 (78.6%)	139 (92.7%)

Figure 34: Bar graph survival rates in WF and WS groups.



8. Diuretics

A large proportion of our patients received diuretics. Out of 14 patients who failed weaning 6 received diuretics and out of 136 patients who did not fail weaning 33 received diuretics. The p values were statistically insignificant for diuretics between the two groups.

9. NIV

Out of 136 patients who passed SBT and were weaned 12 required noninvasive ventilation. While in the WF group out of 14 patients 4 were extubated on NIV. The p values of 0.04 signify that patients who used NIV were more likely to fail weaning.

10. Duration of ventilator days and ICU stay across various groups

In our study the mean duration of mechanical ventilation days and the mean duration of ICU stay was 4.12 ± 2.94 days and 11.33 ± 7.29 days respectively. Our study found no significant differences in mechanical ventilation days and duration of ICU stay among patients with various heart dysfunctions (RV systolic, LV systolic and LV diastolic). However, patients with severe LV systolic dysfunction correlated with longer ventilator days (p = 0.001). These results indicate that there is a strong correlation between severity of LV systolic dysfunction and duration of ventilator days. (p-value: 0.001)

10a.) Mean duration of MV and ICU stay across the total population and among patients with right heart dysfunction postSBT.

The below table provides insights into the duration of ventilator and ICU days in patients with and without right ventricular (RV) systolic dysfunction and is statistically insignificant.

Table 30: Mean duration of MV and ICU stay across the total population and among patients with right heart dysfunction postSBT.

Post SBT RV systolic dysfunction	No	Yes	p-value
Duration of ventilator days (mean ± S.D)	4.12 ± 2.94	3.45 ± 2.58	0.471
Duration of ICU days (mean ± S.D)	11.53 ± 7.45	8.63 ± 4.03	0.204

10b.) Mean duration of MV and ICU stay across the total population and among patients with right heart dysfunction postSBT.

The below table provides insights into the duration of ventilator and ICU days in patients with and without LV systolic dysfunction and is statistically insignificant.

Table 31: Mean duration of MV and ICU stay among patients with normal and LV Systolic dysfunction postSBT.

Our study found no significant differences in mechanical ventilation days and duration of ICU stay among patients with normal and with LV systolic dysfunction.

	Normal LV systolic Function	LV SYSTOLIC DYSFUNCTION
DURATION OF VENTILATOR DAYS (mean ± S.D)	3.89 ± 2.57 days	4.79 ± 4.021 days
DURATION OF ICU DAYS (mean ± S.D)	11.59 ± 7.75 days	10.24 ± 4.830 days

10c.) Mean duration of MV and ICU stay across patients with normal and various grades of LV systolic dysfunction postSBT.

The below table provides insights into the duration of ventilator days and ICU days among patients with different grades of LV systolic dysfunction.

These results indicate that there is a strong correlation between severity of LV systolic dysfunction and duration of ventilator days. (p-value: 0.001) However, no such significance is observed in between patients with severe LV systolic dysfunction and duration of ICU stay which is nonsignificant.

Table 32: Mean duration of MV and ICU stay among patients with different LVEF or Systolic dysfunction postSBT.

	LV systolic dysfunction	LVDD	p value
Duration of ventilator days (mean ± S.D)	Normal	3.89 ± 2.57 days	0.001
	Mild	2.27 ± 0.90 days	
	Moderate	5.60 ± 5.81 days	
	Severe	6.62 ± 4.01 days	
Duration of ICU days (mean ± S.D)	Normal	11.59 ±7.75 days	0.312
	Mild	7.36 ± 2.29 days	
	Moderate	12.40 ±8.02 days	
	Severe	11.33 ±7.29 days	

10d.) Mean duration of MV and ICU stay across patients with normal and various grades of LVDD postSBT.

The below table provides insights into the duration of ventilator and ICU days in patients with and without LVDD and is statistically insignificant with p values of > 0.05.

Table 33: Mean duration of MV and ICU stay among patients with LV Diastolic dysfunction postSBT.

	Normal LV diastolic Function	LVDD	P VALUE
Duration of ventilator days	3.99 ± 2.99	3.82 ± 1.9 days	0.825
Duration of ICU days	10.88 ± 5.55	11.09 ± 5.26 days	0.574

11. Mean duration of MV and ICU stay across patients with WF and WS

The comparison of ventilator days based on WF status reveals a significant difference between the two groups. Patients who did not experience weaning failure had a mean duration of ventilator days of 3.70 ± 2.53 days, while those who did experience WF had a substantially longer mean duration of 7.64 ± 3.95 dyas. The z-value of -4.22 and a p-value of 0.001 indicate a statistically significant difference, suggesting that patients who fail weaning tend to spend significantly more days on MV compared to those who do not. The analysis of ICU days based on WF status shows a significant difference between the two groups. Patients who did not experience weaning failure had a mean duration of ICU days of 10.91 ± 7.32), while those who failed weaning had a mean duration of 15.36 ± 5.65. The z-value of -3.68 and a p-value of 0.001 indicate a statistically significant difference, suggesting that patients who experience WF tend to spend significantly more time in the ICU compared to those who do not.

Table 34: Mean duration of MV and ICU stay across patients with WF and WS

	WS (n=136)	WF (n=14)	P value
Duration of ventilator days (mean ± S.D)	3.70 ± 2.53	7.64 ± 3.95	0.001
Duration of ICU days (mean ± S.D)	10.91 ± 7.32	15.36 ± 5.65	0.001

Figure 35: Bar graph depicting Mean duration of MV across patients with WF and WS

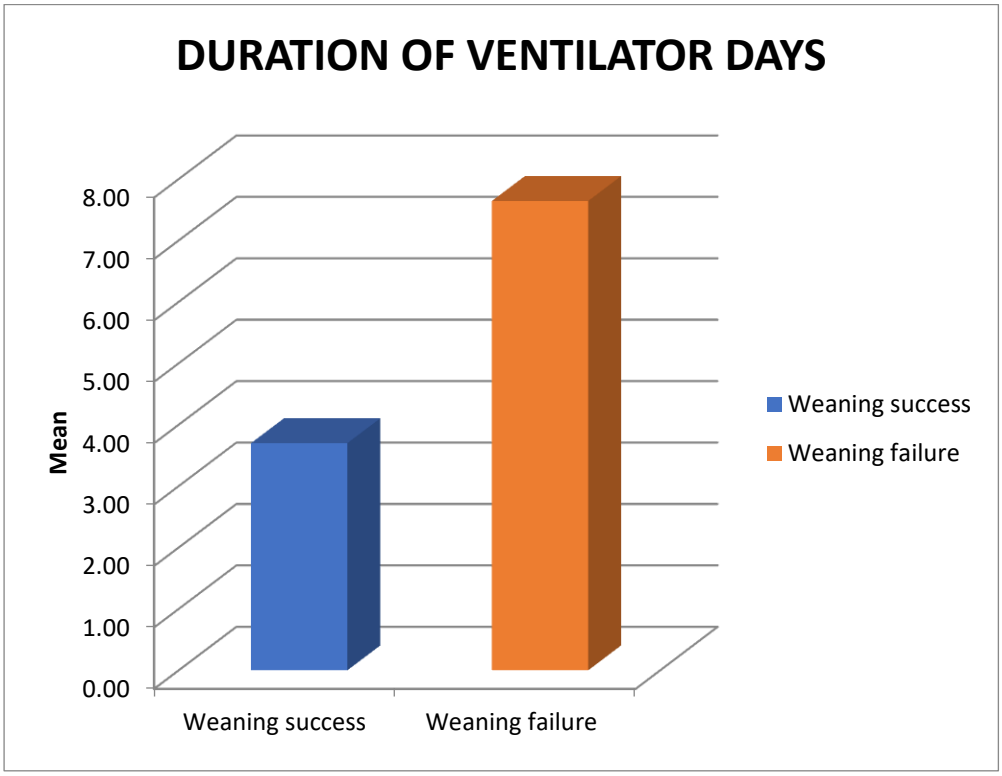
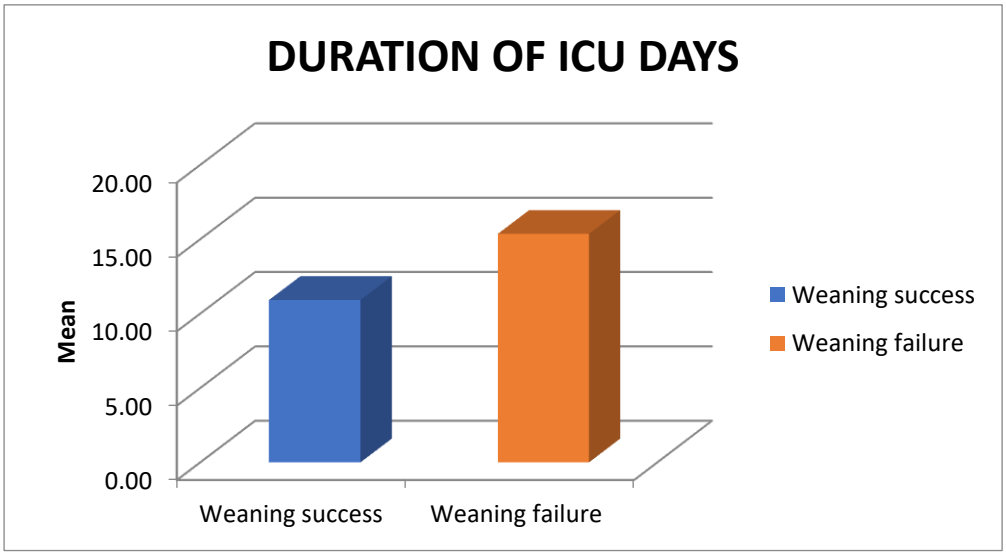


Figure 36: Bar graph depicting Mean duration ICU stay across patients with WF and WS



DISCUSSION

There is growing evidence that TTE can be used to categorize the cardiac origin of respiratory failure. Thus, in our study we assessed cardiac dysfunction induced during the weaning process noninvasively by echocardiography. While previous research has primarily investigated the role of LV systolic and diastolic dysfunction as contributors to WF, the information on right ventricle's contribution to WS or WF still remains deprived. Thus, in this study we tried to evaluate the cardiovascular dysfunction induced during the weaning process and its implications to guide the wean team.

In the present study RV systolic dysfunction was defined according to the ASE/EACVI guidelines.[80] RV systolic dysfunction was diagnosed based on a TAPSE measurement of less than 17mm. Weaning induced RV systolic dysfunction in our study occurred in 7.1% of patients. Though RV systolic dysfunction was rare in patients with preserved EF, patients with reduced EF or any LV systolic dysfunction had significant RV systolic dysfunction rates. (p-value<0.05). This is in line with the existing literature that explains the intricate relationship where LV contraction augments RV ejection- a phenomenon called systolic ventricular interaction.[47,48] As both the ventricles operate in a mutually dependent, complex relationship, integrating their functions. Therefore, any dysfunction in the functioning of the left ventricle significantly affects the functions of the right ventricle.[49]

While LV systolic dysfunction predicts RV systolic dysfunction in our study, the link between RV systolic dysfunction and WF remains obscure as patients with and without RV dysfunction had similar WF rates. (p-value>0.05). Thus, further investigation is warranted to clarify the relationship between RV systolic dysfunction and WF, as current evidence in our study yielded inconclusive findings. Additionally, exploring the interdependence between left and right heart function, particularly how left heart dysfunction impacts right heart performance, is crucial for optimizing weaning outcomes. Also, applying the

fundamental principles of managing RV systolic dysfunction by optimizing RV preload, afterload, and contractility can yield improved outcomes.

In our study LV systolic dysfunction was also defined according to the ASE/EACVI guidelines.[80] Visual LVEF was considered as the primary echo outcome for the evaluation of LV systolic dysfunction. The prevalence of LV systolic dysfunction in preSBT and postSBT group was 20% and 19.3% respectively which was not significant. However, the proportion of patients with severe LV dysfunction increased from 6.7% preSBT to 8.3% postSBT. This might indicate worsening of cardiac function during weaning as mentioned with earlier studies.[74] Thus, the hemodynamic alterations induced during the weaning process may have detrimental consequences in patients with cardiac disease, particularly in those at risk or patients with underlying subtle coronary artery diseases. In such patients weaning may induce localized myocardial ischemia or unmask areas of preexisting marginal function.[106] This suggests that weaning may trigger or worsen underlying cardiac dysfunction.[74] Also, the ECG changes indicating myocardial ischemia during weaning are rare in the general ICU population.[60–62] Notably, research using myocardial perfusion scintigraphy has revealed that weaning induced cardiac dysfunction or new onset LV RWMA can occur without concurrent ECG changes.[46,63] Thus, a high index of suspicion is necessary, as LV systolic dysfunction often is silent during the weaning process. Recognizing cardinal symptoms like chest pain, dyspnea, tachycardia, sweating, and hypotension along with new onset ST segment changes suggestive of myocardial ischemia with elevated cardiac enzymes may help at the bedside in identifying patients with worsened or new onset LV systolic dysfunction.[107,108] Thus, early detection of this LV systolic dysfunction that occurs during weaning may enable prompt intervention, minimizing cardiac damage and facilitating successful weaning.[106,109]

The majority of patients without WF in our study did not have LV systolic dysfunction. However, patients with LV systolic dysfunction had

increased incidence of WF. Also, WF rates varied by LV systolic dysfunction severity. Thus, preexisting LV systolic dysfunction prior to SBT significantly predicted WF in this study (p-value: 0.005). Also, after the SBT, presence of cardiac dysfunction emerged as a significant predictor of WF (p-value: 0.002). Thus, our study confirms a strong correlation between the severity of LV systolic dysfunction and the risk of WF. Similarly Caille et al. in their study found that patients who failed weaning had a significantly low baseline LVEF.[13] However two other studies, one by Moschietto et al. and the other by Mekontso et al did not demonstrate any significant relationship between LVEF and WF.[11,68] These studies concluded that LVDD leading to pulmonary edema was more a cause of WF rather than systolic dysfunction.[68] Also, a recent metaanalysis by Sanfillipo et al. failed to establish any correlation between LVEF and WF and documented association of LVDD as a significant predictor of WF.[93] A metaanalysis by Routsi et al. found that BNP-targeted fluid titration with diuretics in patients with low LVEF lead to more negative fluid balance and increased extubation success. Additionally, the study revealed that BNP-targeted fluid titration outperforms physician-directed therapy, resulting in shorter MV weaning time.[8] The authors also highlighted the importance of pharmacological interventions during weaning to reduce sympathetic stress and alleviate excessive LV load. This can prevent sudden increase in cardiac workload and myocardial oxygen demand, potentially preventing systolic dysfunction.[8] Thus patients with LV systolic dysfunction or patients at high risk of developing LV systolic dysfunction during weaning may benefit from tailored pharmacotherapy, which may include either diuretics, vasodilators, inotropes, alpha-2 agonists, beta blockers, calcium channel blockers and calcium channel sensitizer e.g., levosimendan alone or in combination.[8,41] Such tailored pharmacotherapy, which suits the needs of the patients, can lead to better weaning outcomes.[8,41] However, when pharmacological therapies are ineffective percutaneous interventions or cardiac resynchronization therapy may facilitate weaning from circulatory and respiratory support in such

patients with WF.[109,110] Additionally, coronary artery bypass grafting can help in WS for patients with extensive myocardial ischemia that is identified during SBT.[111]

Moving on to the LV diastolic function, our study employed a simplified classification system to evaluate LV diastolic function.[92] Although many patients were uncategorizable, 65.3% of patients had normal LV diastolic function , and 10.7% had LVDD preSBT. PostSBT normal diastolic function was present in 61.3% and only 7.3% had LVDD. This decrease in LVDD from preSBT to postSBT was relatively modest, and most patients still maintained normal LV diastolic function after the SBT. However, the number of patients uncategorized increased from 24% before SBT to 31.3% after SBT suggesting some improvement or a shift in classification to indeterminate or normal function postSBT. In our study E wave was significantly higher in the post SBT group which is in line with the existing literature. This is suggestive of increase in both preload and afterload that happens during transition from PPV to one's own breathing.[41] The maximal E wave velocity which reflects the driving pressure between the LA and the left ventricle in early diastole is the result of both LV loading condition and relaxation properties.[112] Since increase in E wave velocity is consistent with an increase in preload and afterload diuretics and vasodilators may be helpful in such scenarios to prevent elevation in LVFP.[113] Also, septal e' values were significantly higher in our study post SBT suggesting a role of elevated sympathetic drive or normalization of LV diastolic functions.[83] Other parameters derived on PWD and TDI imaging including A wave, E/A, DCT and E/e' were insignificant both pre and post SBT. The E/e' ratio, a routinely used indicator for LVFP was also insignificant in between WS and WF groups postSBT. This can be explained by the large proportion of our patients who received diuretics after IVC assessment prior to SBT, which might have prevented an increase in LVFP by decreasing the preload. This finding is further supported by the significantly smaller IVC diameter observed in patients with WS after SBT in our study (p=0.025) Also, PS-PEEP with ATC method used in

our study for weaning could have masked LVDD by decreasing preload and afterload thereby increasing LV emptying.[114] This occult LVDD may present post extubation and once the PS-PEEP is discontinued as pulmonary edema.[105] A trial of T-piece thus can unmask underlying LVDD requiring the need for further optimization of the cardiovascular function.[114] A study by Goudelin et al. found that patients with WF had higher maximal E wave velocity when compared to patients with WS. Furthermore, the authors observed that the E/e' ratio did not increase significantly, consistent with our findings which may be in part due to weaning induced sympathetic stimulation, which also led to elevated e' values postSBT.[41] A metaanalysis by Sanfillipo et al. showed that WF was associated with higher E wave velocity, lower e' wave, and higher LVFP. Notably, while E/e' ratio was elevated in WF, it did not correlate significantly with WF. The study thus concluded that the effects of LVDD on WF cannot be fully established as it is possible that such result is because of associated higher comorbidities in such patients. Caille et al. found an increase in E/e’ at baseline in patients with WF but these cutoff values were lower than those found by Moschietto et al. Also, a study by Papnikalou et al. found that E/e’ ratio of more than 7.8 can predict WF.

However, the results in our study are inconsistent with the previous findings suggesting requirement of larger studies to develop predictive model for extubation in patients with LVDD. Also, the heterogeneity in defining LV diastolic function may contribute to the variability in reported incidence and prevalence of LV diastolic dysfunction in critically ill patients. However, given the high prevalence of left LVDD in critically ill patients, clinicians must remain vigilant during the weaning process as delay in diagnosis and management can significantly increase mortality and morbidity. While TTE can aid in diagnosis, management of LVDD relies on the CHEOPS bundle as suggested by Sanfillipo et al. in their study.[115] The CHEOPS bundle stands for: **C**hest Ultrasound (echocardiography and lung ultrasound), **HE**modynamic evaluation (heart rate, rhythm, afterload, and vasoactive drugs), **OP**timization of MV and pulmonary circulation and **S**tabilization

strategies with cautious fluid administration and timely fluid removal.[115] Also, gradually weaning using PS-PEEP appears to impose less stress on the cardiovascular system compared to abrupt transition to a T-piece trial.[116] Use of noninvasive ventilation (NIV) can also assist patients and avoid reintubation as NIV decreases cardiac stress load in patients with poor cardiac reserve.[117,118] NIV is also effective in treating respiratory failure in acute pulmonary edema and LVDD which are associated with WF.[119–121]

In our study the mean duration of mechanical ventilation days and the mean duration of ICU stay was 4.07 ± 2.91 days and 11.33 ± 7.29 days respectively. Our study found no significant differences in mechanical ventilation days and duration of ICU stay among patients with various heart dysfunctions (RV systolic, LV systolic and LV diastolic). However, patients with severe LV systolic dysfunction correlated with longer ventilator days ($p = 0.001$). These results indicate that there is a strong correlation between severity of LV systolic dysfunction and duration of ventilator days (p-value: 0.001) which is consistent with previous studies.[13,109,110]

Out of 150 patients in our study fourteen patients experienced WF out of which two patients required reintubation. Also, eleven patients died during their stay in ICU and out of these eleven patients three were from the WF category while eight were from the WS group. Severe LV systolic dysfunction had the highest proportion of patients with WF (28.6%). Other reasons for WF were loss of sensorium, neuromuscular weakness, fluid overload, tachycardia and tachypnea. Other listed conditions such as use of neuromuscular blocking drugs and steroids each had only a single instance suggesting they might be less common reasons for WF in this dataset. The differences in the demographic parameters in between WS and WF group were insignificant. In intragroup comparison, elderly patients aged 61–70 had the highest proportion of WF signifying old age as a predictor of WF. SOFA and SGA score was not significant in between the WF and WS groups. Also, the presence of comorbidities and other systemic diseases did

not have a significant impact on either WF or WS. PostSBT RR and RSBI were significantly higher in patients who experienced WF ($p<0.05$), but remained well below the threshold for weaning initiation. This might indicate some underlying respiratory distress that occurred because of transition from PPV to spontaneous ventilation. However, other parameters such as TV, PS, PEEP, PaO_2/FiO_2, and FiO_2 did not show any significant differences between the two groups. Patients with WF also had prolonged MV days and ICU stays, confirming established associations ($p=0.001$).[4,6]

The strengths of this study include its prospective design and comprehensive cardiac assessment through transthoracic echocardiography. The sample size was carefully calculated, ensuring that an adequate number of patients were enrolled. Additionally, strict inclusion and exclusion criteria were applied in patient selection, enhancing the study's rigor.

This study however has several limitations. First, it was conducted at a single center with a limited sample size. Second, the use of convenience sampling for randomization may have introduced selection bias. Third, TTE assessments could have wide inter and intra-observer variability. Fourth, various confounding factors including fluid creep, use of diuretic or PS-PEEP with ATC during weaning and NIV post extubation may have influenced cardiac function. Fifth, the study included critically ill patients with diverse pathologies across different ICUs. Sixth, WF due to respiratory or diaphragmatic conditions, or both, was not systematically assessed using ultrasonography. Seventh, the absence of a universally accepted definition for LVDD complicated the data analysis. Finally, incorporating pulmonary artery catheterization or BNP measurements for fluid status assessment would have strengthened our findings.

In summary, systolic and diastolic dysfunction of the heart are common among ICU patients. RV systolic dysfunction though doesn't corelate with WF it is significantly associated with LV systolic dysfunction. Also,

notably LV systolic dysfunction is significantly linked to WF rates, with increasing severity correlating to higher incidence and frequency of WF. This finding might thus indirectly suggest a potential causal link between RV systolic dysfunction and WF in patients with severe LV systolic dysfunction, highlighting the interdependence of ventricular function. However, the study's findings on LVDD and WF are inconclusive due to variability in definition and prevalence rates. Further, successful weaning was associated with smaller inferior vena cava diameters, indicating a net negative fluid balance. Conversely, elderly patients and those with preexisting systolic dysfunction faced increased challenges, including prolonged weaning times, extended ICU stays, and elevated mortality rates.

SUMMARY AND CONCLUSION

This was a prospective observation study conducted in a tertiary care hospital among patients posted for weaning and then extubation in the ICU units. The main objective was to evaluate the cardiovascular dysfunction induced during the weaning process and its outcome in terms of duration of mechanical ventilation requirement and duration of stay in ICU. The study also tried to identify other causes of WF.

Salient findings

- Both RV and LV dysfunction are prevalent in the general ICU population.
- The prevalence of RV dysfunction was 7.1% in this study postSBT.
- RV systolic dysfunction was also significantly associated with LV systolic dysfunction thus highlighting the RV-LV interdependence or systolic ventricular interdependence in critically ill patients.
- The prevalence of LV systolic dysfunction was 19.3% in this study postSBT.
- The proportion with severe dysfunction significantly increased from 6.7% to 8.3% during weaning which might indicate weaning induced worsening of cardiac function.
- LVDD was present in 7.3% of our ICU patients post SBT and the inconsistencies in definition of LVDD potentially contributed to variability in reported prevalence rates as most patients were categorized as indeterminate.
- E wave was significantly higher in the post SBT group which is suggestive of increase in both preload and afterload on weaning.
- Septal e’ values were significantly higher in our study post SBT suggesting a role of elevated sympathetic drive induced by weaning. However, a role of associated tachycardia or hypertension was not established.

- The E/e' ratio between WS and WF groups were nonsignificant, potentially due to proportional increases in E and e' postSBT.
- Additionally, the combined use of PS-PEEP with automatic tube compensation and diuretic therapy may have masked changes in LVFP, leading to an unchanged E/e' ratio
- There was no correlation between RV systolic dysfunction, LVDD, and duration of mechanical ventilation or ICU stay. In contrast, LV systolic dysfunction was significantly linked to prolonged mechanical ventilation requirement and higher mortality rates.
- Severe LV systolic dysfunction also had the highest proportion of patients with WF.
- Other reasons for WF were loss of sensorium, neuromuscular weakness, fluid overload, tachycardia and tachypnoea.

Conclusion and Recommendations

- While TTE can aid in diagnosis, early recognition of new or worsening cardiac dysfunction induced during the process of weaning, is crucial to optimize weaning outcomes and prevent further cardiac damage.
- LV systolic dysfunction is significantly associated with worse weaning outcomes and its management relies on tailored pharmacotherapy with drugs including diuretics, nitrates, inotropes, inodilators, beta blockers, calcium channel blockers or calcium channel sensitizers etc. either alone or in combination.
- Percutaneous interventions or coronary artery bypass grafting may improve weaning outcomes, particularly in patients with severe LV systolic dysfunction unresponsive to pharmacotherapy.
- The association of LVDD with weaning failure could not be established in our study. However, its management is crucial and can be applied using The CHEOPS bundle which stands

for: **C**hest Ultrasound, **H**emodynamic evaluation, **O**ptimization of mechanical ventilation and **S**tabilization strategies.

- A T-piece trial can help unmask patients with worse LVDD, presenting as post-extubation pulmonary edema, by removing pressure support and PEEP. This can enable prior optimization of cardiovascular function and improve weaning outcomes.
- A net negative fluid balance is associated with good weaning outcomes.
- Noninvasive ventilation can assist and avoid reintubation in patients with poor cardiac reserve improving weaning outcomes.
- Noninvasive ventilation is also effective in managing respiratory failure due to LVDD presenting as acute pulmonary edema.
- This study thus provides valuable insights into cardiovascular dysfunction during weaning, guiding evidence-based strategies for improved patient outcomes.

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S No.	MRD	Date	Age (years)	Gender M/F	BMI KG/M^2	SOFA Score PRE SBT	SGA SCORE	CUMULATIVE FLUID BALANCE	NMB DRUG STEROIDS	COMORBIDITIES					SYSTEMIC DISEASES				BASELINE HEMODYNAMICS PRE SBT						
										DM	HTN	COPD	SMOKING	OTHERS	CARDIAC	RENAL	RESPIRATORY	ENDOCRINE	HR	SBP	DBP	MBP	RR	PH	PO2
1	1464170	8-Jun-23	70	F	20.6	2	4	-105	-	-	-	-	-	-	-	-	-	-	108	148	76	100	18	7.45	232
2	1527946	9-Jun-23	71	M	22.3	3	6	610	-	-	-	Y	Y	-	-	-	-	-	76	124	86	98	17	7.44	181
3	1527954	10-Jun-23	61	M	24.6	2	6	3630	-	-	Y	Y	Y	-	-	-	-	-	78	134	86	102	16	7.49	162
4	1535249	12-Jun-23	60	F	21.4	2	5	4550	-	-	-	-	-	-	-	Y	-	-	78	104	68	80	15	7.41	222
5	1537076	18-Jun-23	30	F	21.7	2	6	468	-	-	-	-	-	-	-	-	-	-	70	120	72	88	16	7.4	218
6	1542361	19-Jun-23	35	M	21.8	3	6	1100	-	-	-	-	-	-	-	-	-	-	89	126	68	87	17	7.32	280
7	1542362	24-Jun-23	36	F	18.1	3	2	1360	-	-	-	-	-	-	-	-	-	-	100	102	62	76	13	7.39	208
8	1548695	29-Jun-23	50	M	24.7	2	6	480	-	-	-	-	-	-	-	-	-	-	102	142	88	106	18	7.44	200
9	1553257	10-Jul-23	55	M	19.6	3	3	1080	-	Y	Y	-	-	-	-	-	-	-	78	128	72	90	16	7.42	168
10	1554260	12-Jul-23	45	M	22.4	2	6	-240	-	-	-	-	-	-	-	-	-	-	96	122	84	96	16	7.47	82
11	1554306	18-Jul-23	40	F	21.6	4	5	1260	STEROID	-	-	-	-	-	-	-	-	-	96	110	68	82	16	7.38	180
12	1554310	19-Jul-23	50	F	20.5	2	4	610	-	Y	Y	-	-	-	-	-	-	-	78	104	62	76	16	7.41	162
13	1555412	20-Jul-23	62	F	22.2	3	4	320	-	Y	Y	-	-	-	-	Y	-	-	78	130	78	94	14	7.36	308
14	1555511	24-Jul-23	72	M	23.7	2	4	470	-	Y	Y	-	-	-	-	-	-	-	82	128	84	98	16	7.36	198
15	1557754	25-Jul-23	52	F	20.4	2	3	3330	-	-	-	-	-	-	-	-	-	-	71	120	70	66	19	7.52	180
16	1558327	26-Jul-23	44	M	21.8	6	6	150	-	-	Y	-	-	-	-	-	-	-	86	126	87	100	13	7.4	104
17	1558959	27-Jul-23	30	M	23.6	2	6	-150	-	-	-	-	-	-	-	-	-	-	102	128	72	87	18	7.38	267
18	1558365	28-Jul-23	33	M	24.4	5	6	4070	-	-	-	-	-	-	-	-	-	-	108	118	66	84	19	7.37	227
19	1558970	29-Jul-23	20	M	19.5	6	3	-50	-	-	-	-	-	-	-	-	-	-	94	119	80	93	19	7.45	216
20	1560957	3-Aug-23	32	M	22.7	4	6	3580	-	-	-	-	-	-	-	-	-	-	86	140	70	105	22	7.48	132
21	1562513	7-Aug-23	43	M	23.4	5	4	1715	-	-	-	Y	-	-	-	Y	Y	-	99	181	70	92	25	7.5	171
22	1564672	10-Aug-23	52	M	22.6	4	6	4865	-	-	-	-	-	-	-	-	-	-	119	114	58	72	24	7.38	196
23	1566066	10-Aug-23	58	M	30	5	6	800	-	-	-	-	-	-	-	-	-	-	66	150	96	113	15	7.42	160
24	1566983	10-Aug-23	57	F	32.3	2	6	1330	-	Y	Y	-	-	-	-	-	-	-	90	170	73	101	18	7.46	138
25	1569757	13-Aug-23	26	M	21.4	2	4	700	-	-	-	-	-	-	-	-	-	-	100	124	66	86	18	7.47	224
26	659099	18-Aug-23	58	F	25.6	2	4	-800	-	Y	Y	-	-	-	-	-	-	-	93	121	83	92	15	7.37	197
27	1576748	25-Aug-23	58	M	22.9	2	5	800	-	-	-	-	-	-	-	-	-	-	86	112	60	78	14	7.51	86
28	1559468	26-Aug-23	31	M	22.2	4	6	700	-	-	-	-	-	-	-	-	-	-	54	146	76	93	17	7.44	130
29	1542982	27-Aug-23	25	M	19.9	3	3	2480	-	-	-	-	-	-	-	-	-	-	97	120	65	83	18	7.41	336
30	1572864	28-Aug-23	43	M	23.5	2	5	1850	-	-	-	-	-	-	-	-	-	-	72	126	82	92	18	7.45	283
31	1580622	1-Sep-23	25	M	24.2	3	6	-60	-	-	-	-	-	-	-	-	-	-	52	155	52	98	17	7.36	192
32	1584321	13-Sep-23	38	M	30.2	2	6	550	-	-	-	-	-	-	-	-	-	-	67	117	62	80	16	7.43	193
33	1575931	13-Sep-23	35	F	22.1	2	4	1575	-	-	-	-	-	-	-	-	-	-	114	107	78	81	14	7.56	212
34	1588033	20-Sep-23	32	M	26.7	4	5	1296	-	-	Y	Y	Y	-	-	-	-	-	100	144	95	109	24	7.48	133
35	1592330	20-Sep-23	21	F	18.4	4	3	1575	-	-	-	-	-	-	-	-	-	-	69	114	90	108	14	7.35	227
36	1552250	21-Sep-23	65	F	24	2	6	2179	-	-	Y	-	-	-	-	-	-	-	60	135	80	97	16	7.4	101
37	1593432	22-Sep-23	52	M	26.8	3	5	810	-	Y	Y	-	-	-	-	-	-	-	87	146	93	110	16	7.4	183
38	1491180	29-Sep-23	71	M	21.5	2	5	2381	-	-	Y	Y	-	-	-	-	-	-	76	149	83	110	17	7.39	225
39	1583692	13-Sep-23	65	M	24.8	6	6	1120	-	-	-	-	-	-	-	-	-	-	89	139	86	101	16	7.36	165
40	1587199	13-Sep-23	22	M	23.2	5	5	1450	-	-	-	-	-	-	-	-	-	-	101	132	92	102	17	7.45	157
41	1588829	16-Sep-23	49	M	21.4	4	5	1915	-	Y	Y	Y	-	-	-	Y	-	-	76	122	68	86	16	7.38	138
42	1589135	16-Sep-23	60	F	38	6	6	1796	-	-	Y	-	-	-	-	-	-	HYP0THYROID	66	137	66	77	14	7.39	125
43	1592317	21-Sep-23	27	M	19.5	2	3	1550	-	-	-	-	-	-	-	-	-	-	70	120	82	88	13	7.41	212
44	1592335	21-Sep-23	21	M	21.8	6	6	150	-	-	-	-	-	-	-	-	-	-	89	124	78	92	14	7.44	247
45	144579	25-Sep-23	66	F	19.5	4	3	2600	-	-	Y	-	-	-	-	-	-	-	75	136	58	84	16	7.46	140
46	1595565	25-Sep-23	56	F	25	4	6	600	-	-	Y	-	-	-	-	-	-	-	88	136	80	94	12	7.52	201
47	1552250	26-Sep-23	65	F	28	4	5	-218	-	Y	Y	-	-	-	-	-	-	-	53	171	100	118	12	7.66	87
48	1605032	10-Oct-23	65	M	28.8	2	6	865	-	-	-	-	-	-	-	-	-	-	86	121	76	94	17	7.41	179
49	1605009	11-Oct-23	47	M	24.6	4	5	850	-	-	Y	-	-	-	-	-	-	-	100	150	98	130	16	7.38	179
50	1609244	18-Oct-23	33	M	23.8	2	5	2065	NMB DRUG	-	-	-	-	-	-	-	-	-	74	147	84	99	13	7.48	199
51	871352	19-Oct-23	72	M	22.9	4	5	3414	-	-	-	-	-	-	-	-	-	-	75	137	56	86	17	7.52	221
52	1581911	3-Nov-23	23	M	18.5	6	2	5925	-	-	-	-	-	-	-	-	-	-	94	103	67	70	17	7.35	147

S No.	MRD	BASELINE ABG PRE SBT				REASON FOR MECHANCIAL VENTILATION(MV)					DURATION OF MV								
						POST	NEURO	ALI/ or	SEPSIS	OTHER									
		PCO2	HCO3	LACTATE	GLUCOSE	SURGICAL	TRAUMA	LUNG INFECTION			PRE SBT	LVEF	E (cm/sec)	A (cm/sec)	E/A	DCT(ms)	Lateral e'(cm/sec)	Lateral a'(cm/sec)	Septal e'(cm/sec)
1	1464170	31	21.5	1.4	252	Y	-	-	-	-	2	GOOD	78.2	78.2	1	100	-	-	4.95
2	1527946	34	23.1	1.5	290	Y	-	-	-	-	2	GOOD	73	107	0.68	270	-	-	10.7
3	1527954	48	40.4	1.2	168	Y	-	-	-	-	3	GOOD	81.1	54.6	1.48	140	-	-	8.98
4	1535249	30	21.1	2.2	98	Y	-	-	-	-	5	GOOD	86.9	79.7	1.09	180	-	-	7.55
5	1537076	36	22.4	0.6	124	Y	-	-	-	-	1	GOOD	106.1	82.6	1.28	220	-	-	14.6
6	1542361	38	22.4	0.5	126	Y	-	-	-	-	3	GOOD	96.2	72.5	1.32	170	-	-	12.6
7	1542362	31	21	1.3	168	Y	-	-	-	-	2	GOOD	92	68	1.35	210	-	-	10.8
8	1548695	36	24.5	1.2	164	-	Y	-	-	-	4	GOOD	61.7	69.6	0.88	240	-	-	10.9
9	1553257	32	22.6	0.8	192	-	Y	-	-	-	4	GOOD	77.5	74.7	1.03	180	-	-	7.81
10	1554260	39	22.4	1.1	235	-	Y	-	-	-	2	GOOD	103.4	93.3	1.1	120	-	-	11.2
11	1554306	36	22	0.1	196	-	-	-	-	SNAKEBITE	3	GOOD	92.6	90.4	1.02	150	-	-	12.1
12	1554310	34	21.6	0.6	176	Y	-	-	-	-	2	GOOD	84	95.5	0.87	260	-	-	6.51
13	1555412	34	20.1	0.6	124	Y	-	-	-	-	1	GOOD	101	98.3	1.02	130	-	-	13
14	1555511	34	22.2	1.4	260	Y	-	-	-	-	2	GOOD	110	94.6	1.16	220	-	-	12.8
15	1557754	22	22.3	1.3	119	-	-	-	-	SNAKEBITE	2	GOOD	86.1	58.9	1.46	180	-	-	11.1
16	1558327	38	25.3	1.3	166	-	Y	-	-	-	2	GOOD	76.1	59.6	1.27	160	-	-	7.81
17	1558959	40	24	2.6	136	-	Y	-	-	-	8	GOOD	91.9	66	1.39	190	-	-	11.8
18	1558365	25	18.8	3.2	112	Y	-	-	-	-	2	GOOD	76.8	84.3	0.91	220	-	-	10.5
19	1558970	44	29.5	1	127	-	Y	-	-	-	3	GOOD	89	69.6	1.27	250	-	-	11.7
20	1560957	38	28.4	0.8	97	-	Y	-	-	-	4	GOOD	96.9	81.1	1.2	240	-	-	10.3
21	1562513	31	26.2	2.4	172	Y	-	-	-	-	1	GOOD	114.9	98.3	1.16	220	-	-	12.1
22	1564672	40	24	1.5	86	Y	-	-	-	-	5	GOOD	129.9	101.9	1.27	240	-	-	12
23	1566066	40	28.9	0.9	151	-	Y	-	-	-	4	GOOD	73.9	67.5	1.09	210	-	-	12.5
24	1566983	32	24.5	1	253	-	Y	-	-	-	3	GOOD	100.5	125.6	0.8	260	-	-	7.55
25	1569757	25	22	3.2	174	Y	-	-	-	-	2	SEVERE	84	61.7	1.36	220	-	-	13.4
26	659099	35	21.6	1.5	300	Y	-	-	-	-	2	GOOD	66	77.5	0.85	270	-	-	5.34
27	1576748	30	31.5	1.2	167	Y	Y	-	-	-	6	GOOD	58.1	57.6	1	250	-	-	7.16
28	1559468	39	26.5	0.7	122	-	Y	-	-	-	1	GOOD	107	92.7	1.15	210	-	-	13.5
29	1542982	37	24.2	3.7	158	Y	-	-	-	-	2	GOOD	68.9	49.5	1.39	230	-	-	14.5
30	1572864	29	27.8	0.2	120	-	Y	-	-	-	3	GOOD	76.8	68.9	1.1	180	13.4	8.46	9.38
31	1580622	42	24.2	0.3	164	Y	-	-	-	-	1	GOOD	89.4	49.5	1.89	240	-	-	14.3
32	1584321	30	22.1	0.9	110	-	Y	-	-	-	2	GOOD	96.2	66.8	1.4	270	-	-	15.8
33	1575931	30	20.9	0.8	240	Y	-	-	-	-	1	GOOD	77.5	83.3	0.93	180	-	-	9.25
34	1588033	39	28.9	1.3	186	Y	-	-	-	-	9	MODERATE	101.2	77.5	1.3	240	-	-	13.9
35	1592330	33	19.9	1.8	179	Y	-	-	-	-	2	GOOD	90.4	93.3	0.96	240	-	-	11.8
36	1552250	37	23.7	3.2	161	Y	-	-	-	-	1	MILD	127.1	71.8	1.77	250	-	-	13.8
37	1593432	34	22.5	2.1	104	Y	-	-	-	-	2	GOOD	58.9	73.9	0.79	260	-	-	7.29
38	1491180	41	28	1.5	184	Y	-	-	-	-	3	GOOD	81.3	76.1	1.07	220	-	-	10.3
39	1583692	40	23.2	0.8	159	-	Y	-	-	-	3	GOOD	78	99.1	0.78	240	-	-	8.46
40	1587199	34	25	0.8	117	-	Y	-	-	-	3	GOOD	86.9	81.8	1.06	270	-	-	13.5
41	1588829	36	22.2	0.9	118	Y	-	-	-	-	2	GOOD	88.9	69.6	1.27	190	-	-	11.7
42	1589135	37	23.2	1.3	165	Y	-	-	-	-	3	GOOD	84	84.7	0.99	270	-	-	12.6
43	1592317	30	20.9	1.3	132	-	Y	-	-	-	3	GOOD	76.8	56	1.37	260	-	-	11.6
44	1592335	38	26.8	1.6	120	-	Y	-	-	-	3	GOOD	99.8	60.3	1.65	220	-	-	16.8
45	144579	35	21	0.9	162	Y	-	-	-	-	3	MODERATE	72.5	88.3	0.82	240	-	-	12.8
46	1595565	40	32	1.9	248	-	Y	-	-	-	2	GOOD	81.8	89	0.92	270	-	-	8.2
47	1552250	29	34.2	2.9	117	Y	-	-	-	-	3	MILD	71.8	76.1	0.94	240	-	-	6.64
48	1605032	30	21.3	1	264	Y	-	-	-	-	2	GOOD	77.5	80.4	0.96	180	-	-	12.2
49	1605009	33	21.3	1.6	196	-	Y	-	-	-	3	GOOD	44.7	89.7	0.49	230	-	-	8.85
50	1609244	39	29.1	1	113	-	-	-	-	OP POISONING	5	GOOD	104.8	60.3	1.73	180	-	-	15.5
51	871352	35	29.3	1.8	88	Y	-	-	-	-	1	MILD	68.2	86.9	0.78	240	9.11	10.7	8.2
52	1581911	33	22	2.2	182	Y	-	-	-	-	2	GOOD	93.3	79.7	1.17	230	-	-	14.8

S No.	MRD	PRE SBT											
		SEPTAL a'(cm/sec)	Average e'	Average a'	E/e'	TAPSE(cm/sec)	IVC MAX_{DIA} (cm)	IVC MIN_{DIA} (cm)	IVC COMPRESSIBILTY (%)	IVC DISTENSIBILTY (%)	DIURETICS USE	LV SYSTOLIC DYSFUNCTION
1	1464170	9.64	-	-	12.1	2.14	0.95	0.69	27.4	37	-	-
2	1527946	14.2	-	-	6.82	2.46	1.32	1.07	18.9	23	-	-
3	1527954	8.2	-	-	9.03	2.14	2.02	1.2	40	68	Y	-
4	1535249	10.2	-	-	11.5	2.14	1.7	1.32	22.4	28	-	-
5	1537076	9.98	-	-	7.267	2.16	1.36	0.78	42	74	-	-
6	1542361	8.85	-	-	7.6	2.2	2.08	1.58	24	31	Y	-
7	1542362	7.12	-	-	8.51	2	1.76	1.26	30	39	-	-
8	1548695	11.5	-	-	5.66	1.95	1.51	1.01	33	49	-	-
9	1553257	9.9	-	-	9.9	2.59	1.33	0.81	39	64	-	-
10	1554260	10.7	-	-	9.2	2.27	1.01	0.38	62	165	-	-
11	1554306	9.9	-	-	7.65	1.76	1.39	0.76	45.3	82	-	-
12	1554310	9.25	-	-	12.9	2.65	1.45	0.95	34	52	-	-
13	1555412	11.2	-	-	7.76	1.32	2	0.95	54	110	-	-
14	1555511	7.9	-	-	8.59	2.1	1.3	0.76	41	70	-	-
15	1557754	8.33	-	-	7.75	2.27	1.83	1.45	20.8	26	Y	-
16	1558327	7.42	-	-	9.74	2.37	1.5	0.81	47.7	85	-	-
17	1558959	13	-	-	7.7	2.21	1.51	0.88	41.7	71	-	-
18	1558365	12.8	-	-	7.31	1.76	1.23	0.86	30	43	-	-
19	1558970	5.34	-	-	7.6	2.21	1.39	0.95	31.7	46	-	-
20	1560957	7.68	-	-	9.4	1.83	1.72	1.01	42	70	-	-
21	1562513	6.9	-	-	9.49	2.27	1.39	0.44	68.3	21	-	-
22	1564672	9.9	-	-	10.8	2.21	1.45	0.76	47.6	90	-	-
23	1566066	7.94	-	-	5.91	1.95	1.89	1.32	30	43	-	-
24	1566983	8.98	-	-	13.3	2.27	1.01	0.38	62.4	165	Y	-
25	1569757	8.46	-	-	6.2	2.08	1.07	0.5	53.3	114	-	SEVERE
26	659099	6.38	-	-	12.35	1.87	1.64	1.2	26.8	36	-	-
27	1576748	10	-	-	8.11	1.9	1.78	1.33	25.3	33	-	-
28	1559468	14.6	-	-	7.48	2.46	1.58	1.01	36.1	56	-	-
29	1542982	7.81	-	-	4.75	2.02	1.08	0.6	44	80	-	-
30	1572864	8.07	11.4	8.3	6.74	2.02	1.89	1.26	33.3	50	-	-
31	1580622	8.46	-	-	6.57	1.95	2.21	1.26	43	75	Y	-
32	1584321	10.7	-	-	6.08	1.95	2.5	1.83	29.1	36	Y	-
33	1575931	11.5	-	-	8.37	1.83	1.2	0.69	42.5	73	-	-
34	1588033	8.2	-	-	8.2	1.95	1.26	0.69	45.2	82	-	SEVERE
35	1592330	6.12	-	-	7.66	2.02	1.26	0.63	50	100	-	-
36	1552250	8.7	-	-	9.2	2.02	1.13	0.63	44.2	79	-	MILD
37	1593432	13	-	-	8.07	2	1.41	0.85	42	34	-	-
38	1491180	10	-	-	7.94	1.76	2.08	1.32	36.5	57	Y	-
39	1583692	6.64	-	-	9.2	2.07	1.41	0.81	42	74	-	-
40	1587199	12.2	-	-	6.43	1.76	1.58	0.82	48	92	-	-
41	1588829	6.64	-	-	7.42	2.08	0.76	0.5	34.2	52	-	-
42	1589135	12.2	-	-	6.66	2.27	2.21	1.32	40	67	Y	-
43	1592317	4.3	-	-	6.62	1.77	1.4	0.62	55.7	125	-	-
44	1592335	7.16	-	-	5.94	2.14	1.33	0.67	49.6	98	-	-
45	144579	5.6	-	-	5.66	1.76	2.32	1.63	29	42	Y	MODERATE
46	1595565	6.9	-	-	9.97	1.83	1.51	1.26	17	19	-	-
47	1552250	10.8	-	-	10.8	2.08	1.39	1.01	27.3	37	Y	MILD
48	1605032	8.72	-	-	6.3	2.21	1.95	1.32	32.2	47	-	-
49	1605009	14.3	-	-	5.02	1.83	1	0.4	60	150	-	-
50	1609244	8.72	-	-	6.76	2.02	1.95	1.51	22.6	29	Y	-
51	871352	11.,3	8.65	11	6.2	1.83	1.47	0.86	41	70	-	MILD
52	1581911	8.2	-	-	6.3	2.14	1.39	0.95	31.7	46	-	-

S No.	MRD	ECHO ASSESSMENT											
		LV DIASTOLIC DYSFUNCTION (Grade)	RIGHT VENTRICULAR DYSFUNCTION	LVEF	E (cm/sec)	A (cm/sec)	E/A	DCT(ms)	Lateral e'(cm/sec)	Lateral a'(cm/sec)	SEPTAL e'(cm/sec)	SEPTAL a'(cm/sec)	Average e'
1	1464170	2 PSUEDONORMAL	-	GOOD	100.5	92.6	1.08	130	-	-	4.82	12	-
2	1527946	INDETERMINATE	-	GOOD	73.9	107.7	0.6	140	-	-	10.9	14.6	-
3	1527954	INDETERMINATE	-	GOOD	88.3	45.2	1.95	140	-	-	10.4	9.11	-
4	1535249	2 PSUEDONORMAL	-	GOOD	94.6	85.4	1.1	260	-	-	9.9	8.83	-
5	1537076	NORMAL	-	GOOD	102.4	94.6	1.08	260	-	-	12.9	10.9	-
6	1542361	NORMAL	-	GOOD	83.3	65	1.28	230	-	-	11.2	8.85	-
7	1542362	INDETERMINATE	-	GOOD	66	79	0.83	220	-	-	9.64	8.2	-
8	1548695	NORMAL	-	GOOD	68	84	0.78	250	-	-	13	7.81	-
9	1553257	PSUEDONORMAL	-	GOOD	69.6	65.6	1.06	200	-	-	10.2	11.8	-
10	1554260	INDETERMINATE	-	GOOD	83.3	84	0.99	160	-	-	6.25	11.2	-
11	1554306	NORMAL	-	GOOD	93.3	75.4	1.27	170	-	-	14.5	11.3	-
12	1554310	PSUEDONORMAL	-	GOOD	69.6	95.5	0.72	230	-	-	6.38	14.3	-
13	1555412	NORMAL	Y	GOOD	109.8	98	1.12	140	-	-	8.46	8.98	-
14	1555511	INDETERMINATE	-	GOOD	110.6	84.8	1.16	170	-	-	14.1	10.4	-
15	1557754	NORMAL	-	GOOD	84.1	81.8	1.018	170	-	-	12.5	10.2	-
16	1558327	PSUEDONORMAL	-	GOOD	75.4	65.3	1.15	130	-	-	6.9	7.81	-
17	1558959	NORMAL	-	GOOD	65.3	48.8	1.33	180	-	-	11.8	8.85	-
18	1558365	NORMAL	-	GOOD	69.2	75.4	0.91	180	-	-	12.1	17.4	-
19	1558970	NORMAL	-	GOOD	77.5	45.2	1.71	230	-	-	11.3	3.65	-
20	1560957	INDETERMINATE	-	GOOD	96.2	77.5	1.24	220	-	-	12.5	9.51	-
21	1562513	INDETERMINATE	-	GOOD	104	69.6	1.24	140	-	-	13.2	10.5	-
22	1564672	INDETERMINATE	-	GOOD	129.9	114.1	1.13	210	-	-	14.2	11.7	-
23	1566066	NORMAL	-	GOOD	76.8	72.5	1.05	150	-	-	9.25	7.55	-
24	1566983	PSUEDONORMAL	-	GOOD	97.6	112.7	0.86	240	-	-	9.9	8.46	-
25	1569757	NORMAL	-	SEVERE	71.8	63.9	1.12	190	-	-	9.9	9.25	-
26	659099	PSUEDONORMAL	-	GOOD	58.1	66.8	0.88	180	-	-	7.31	8.36	-
27	1576748	INDETERMINATE	-	GOOD	77.5	83.3	0.93	180	-	-	9.25	11.5	-
28	1559468	NORMAL	-	GOOD	117.7	66.8	1.75	180	-	-	15.2	9.38	-
29	1542982	NORMAL	-	GOOD	81.1	58.9	1.37	230	-	-	18.6	10.3	-
30	1572864	NORMAL	-	GOOD	54.6	63.2	0.86	190	13.4	10	12.8	16.3	13.1
31	1580622	NORMAL	-	GOOD	99.1	49.5	2	240	-	-	13.7	7.81	-
32	1584321	NORMAL	-	GOOD	110.5	82.6	1.33	200	-	-	13.3	8.85	-
33	1575931	INDETERMINATE	-	GOOD	78.2	84	0.93	140	-	-	15.4	7.81	-
34	1588033	NORMAL	-	SEVERE	74.2	75.4	0.99	220	-	-	10.2	7.29	-
35	1592330	NORMAL	-	GOOD	109.1	81.8	1.33	180	-	-	12.6	6.51	-
36	1552250	INDETERMINATE	-	MILD	120.6	62.5	1.92	300	-	-	11.1	10.4	-
37	1593432	PSUEDONORMAL	-	GOOD	66.8	77.5	0.86	270	-	-	8.33	13.4	-
38	1491180	NORMAL	-	GOOD	90.4	77.5	1.16	240	-	-	13	7.16	-
39	1583692	INDETERMINATE	-	GOOD	74.7	89.7	0.83	210	-	-	7.16	6.64	-
40	1587199	NORMAL	-	GOOD	83.5	70.5	1.18	280	-	-	15.9	6.77	-
41	1588829	NORMAL	-	GOOD	96.8	74.5	1.29	210	-	-	13.6	8.4	-
42	1589135	NORMAL	-	GOOD	78.2	71.1	1.09	260	-	-	13.8	12.1	-
43	1592317	NORMAL	-	GOOD	70.3	47.4	1.48	220	-	-	12.4	5.08	-
44	1592335	NORMAL	-	GOOD	103.4	53.1	1.94	250	-	-	14.8	7.03	-
45	144579	NORMAL	-	MODERATE	63.9	86.1	0.74	130	-	-	14.1	7.16	-
46	1595565	INDETERMINATE	-	GOOD	79	88.3	0.89	250	-	-	5.99	7.68	-
47	1552250	PSUEDONORMAL	-	MILD	75.4	54.6	1.38	260	-	-	6.38	10	-
48	1605032	NORMAL	-	GOOD	59.6	63.9	0.93	190	-	-	10.7	9.25	-
49	1605009	INDETERMINATE	-	GOOD	38	84	0.45	160	-	-	6.38	10	-
50	1609244	NORMAL	-	GOOD	91.2	66.8	1.36	210	-	-	16.8	6.9	-
51	871352	INDETERMINATE	-	GOOD	79	96.4	0.81	260	11.5	15.6	8.3	12.1	13.5
52	1581911	NORMAL	-	GOOD	46	54	0.85	220	-	-	8.8	5.72	-

S No.	MRD	POST SBT										V		
		Average a'	E/e'	TAPSE(cm/sec)	IVC MAX $_{DIA}$ (cm)	IVC MIN $_{DIA}$ (cm)	IVC COMPRESSIBILTY (%)	IVC DISTENSIBILTY (%)	LV SYSTOLIC DYSFUNCTION	LV DIASTOLIC DYSFUNCTION	RV SYSTOLIC DYSFUNCTION	TV	RR	RSBI
1	1464170	-	20.8	2.02	1	0.6	40	66	-	INDETERMINATE	-	400	16	40
2	1527946	-	6.77	2.9	2.39	1.32	44.8	81	-	INDETERMINATE	-	475	17	35
3	1527954	-	8.49	1.83	1.83	1.45	20	26	-	INDETERMIANTE	-	450	16	35
4	1535249	-	8.62	2.08	1.32	0.82	38	60	-	INDETERMINATE	-	437	15	34
5	1537076	-	7.93	2.21	1.48	0.7	52	111	-	NORMAL	-	450	16	35
6	1542361	-	7.43	2.3	2.33	1.76	24.5	32	-	NORMAL	-	448	20	44
7	1542362	-	6.84	2.08	1.86	1.15	38	61	-	INDETERMINATE	-	400	16	40
8	1548695	-	5.07	2.46	2.14	1.45	32.2	47	-	NORMAL	-	450	16	35
9	1553257	-	6.8	2.27	1.13	0.57	49.6	98	-	NORMAL	-	490	14	28
10	1554260	-	13.3	1.89	1.32	0.95	28	38	-	2	-	500	15	30
11	1554306	-	6.43	2.39	1.83	1.45	20.8	26	-	NORMAL	-	512	14	27
12	1554310	-	10.9	2.08	1.26	0.63	50	100	-	INDETERMINATE	-	450	16	35
13	1555412	-	12.9	1.2	1.45	0.5	66	190	-	INDETERMINATE	Y	450	14	31
14	1555511	-	7.9	2.2	1.46	0.93	36	56	-	NORMAL	-	450	18	40
15	1557754	-	6.72	2.39	1.64	1.13	31.3	45.1	-	NORMAL	-	432	17	40
16	1558327	-	10.92	2.52	1.33	0.96	27.8	38	-	PSUEDONORMAL	-	543	13	23
17	1558959	-	5.53	1.83	1.95	1.32	32.3	47	-	NORMAL	-	450	18	40
18	1558365	-	5.71	2.02	1.83	0.95	48.1	92	-	NORMAL	-	450	18	40
19	1558970	-	6.85	1.89	1.26	1.01	19.8	24	-	NORMAL	-	450	17	37
20	1560957	-	7.69	2.02	1.7	1.07	37.1	58	-	NORMAL	-	450	22	48
21	1562513	-	9.57	2.08	1.26	0.44	65.1	186	-	INDETERMINATE	-	411	26	63
22	1564672	-	9.14	2.2	1.26	0.49	65.1	157	-	INDETERMINATE	-	450	24	54
23	1566066	-	8.3	1.76	1.95	1.7	12.8	14	-	INDETERMINATE	-	500	14	28
24	1566983	-	9.79	2.52	1.32	0.88	33.3	50	-	INDETERMINATE	-	450	18	40
25	1569757	-	7.25	2.33	1.45	1.13	22.1	28	SEVERE	NORMAL	-	450	18	40
26	659099	-	7.67	1.95	1.78	1.32	25	34	-	INDETERMINATE	-	450	15	34
27	1576748	-	8.37	1.83	1.2	0.69	42.5	73	-	INDETERMINATE	-	477	12	25
28	1559468	-	7.7	2.08	1.89	1.39	26.5	35	-	NORMAL	-	450	17	37
29	1542982	-	4.36	1.76	1.51	1.13	25.2	33	-	NORMAL	-	500	18	36
30	1572864	13.15	4.16	1.95	1.64	1.12	31	46	-	NORMAL	-	450	18	40
31	1580622	-	7.23	1.76	1.64	1.39	15.2	17	-	NORMAL	-	450	17	37
32	1584321	-	8.3	1.95	1.2	0.82	31.7	46	-	INDETERMINATE	-	443	16	36
33	1575931	-	5.07	2.08	1.01	0.5	50	102	-	NORMAL	-	450	14	31
34	1588033	-	3.55	2.02	0.76	0.32	57.9	137	SEVERE	NORMAL	-	439	24	54
35	1592330	-	8.65	2.52	1.26	0.57	54.8	121	-	INDETERMINATE	-	450	14	31
36	1552250	-	10.86	1.83	1.26	1.01	19.8	24	MILD	INDETERMINATE	-	570	21	37
37	1593432	-	8	2.07	1.7	1.33	21.8	27	-	NORMAL	-	450	17	37
38	1491180	-	6.95	1.86	1.58	0.95	39.9	66	-	NORMAL	-	446	19	42
39	1583692	-	10.43	1.78	1.55	0.69	56	124	-	2	-	450	16	28
40	1587199	-	5.25	1.85	1.63	1.04	36	56	-	NORMAL	-	450	14	32
41	1588829	-	7.11	2.16	0.93	0.42	54	121	-	NORMAL	-	464	18	38
42	1589135	-	5.6	2.14	1.45	1.01	30.3	43	-	NORMAL	-	477	14	30
43	1592317	-	5.66	1.7	1.45	1.01	31	43	-	NORMAL	-	558	12	21
44	1592335	-	6.98	1.95	1.83	1.51	17.5	21	-	NORMAL	-	507	14	29
45	144579	-	4.53	1.63	1.29	0.98	24	31	MODERATE	INDETERMINATE	Y	465	18	38
46	1595565	-	10.2	1.95	1.39	0.76	45.3	82	-	2	-	450	14	31
47	1552250	-	11.8	2.02	1.13	0.82	27.4	37	MILD	PSUEDONORMAL	-	400	14	35
48	1605032	-	5.5	2.65	1.64	0.82	50	100	-	NORMAL	-	488	29	60
49	1605009	-	5.95	1.76	1.2	0.5	58.3	140	-	1	-	490	17	34
50	1609244	-	7.7	2.14	1.45	0.82	43.4	76	-	NORMAL	-	476	12	25
51	871352	11.95	7.1	1.64	1.47	0.98	33	50	-	NORMAL	Y	450	16	36
52	1581911	-	5.22	2.2	1.45	1.06	26	36	-	NORMAL	-	460	17	37

S No.	MRD	VENTILATOR PARAMETERS/WEANING PARAMETERS										SBT	REASON	DURATION OF VENTILATOR DAYS	NIV USED	REINTUBATION	DURATION OF ICU DAYS	28 DAY OUTCOME		INCLUDED	EXCLUDED	LVEF	E (cm/sec)	A (cm/sec)
		PRE SBT			POST SBT																			
		PEEP	FiO2	PaO_2/FIO_2	TV	RR	RSBI	PS	PEEP	PaO_2/FIO_2	FIO_2	FAILURE						SURVIVOR	NONSURVIVOR					
1	1464170	5	40	464	352	19	50	6	5	432	40	-	-	2	-	-	7	SURVIVOR	-	Y	-	-	-	-
2	1527946	5	40	362	743	19	25	0	5	370	40	-	-	2	-	-	7	SURVIVOR	-	Y	-	-	-	-
3	1527954	5	40	360	380	24	63	6	5	360	40	-	-	11	Y	-	28	SURVIVOR	-	Y	-	-	-	-
4	1535249	5	40	444	400	16	50	10	5	410	40	-	-	6	-	-	15	SURVIVOR	-	Y	-	-	-	-
5	1537076	5	40	436	412	28	65	0	5	380	40	-	-	2	-	-	6	SURVIVOR	-	Y	-	-	-	-
6	1542361	5	40	560	458	13	27	0	5	526	40	-	-	3	-	-	7	SURVIVOR	-	Y	-	-	-	-
7	1542362	5	40	416	437	12	27	6	5	408	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
8	1548695	5	40	400	560	18	32	6	5	430	40	-	-	6	-	-	10	SURVIVOR	-	Y	-	-	-	-
9	1553257	5	40	336	484	18	37	6	5	318	40	-	-	4	-	-	9	SURVIVOR	-	Y	-	-	-	-
10	1554260	5	40	164	470	18	38	6	5	168	40	-	-	2	-	-	10	SURVIVOR	-	Y	-	-	-	-
11	1554306	5	40	360	480	18	37	6	5	350	40	-	-	7	-	Y	21	SURVIVOR	-	Y	-	GOOD	89.6	73.9
12	1554310	5	40	324	502	15	29	6	5	330	40	Y	ALTERED SENSORIUM	5	-	-	12	SURVIVOR	-	Y	-	GOOD	74.6	93.2
13	1555412	5	40	616	480	12	20	0	5	558	40	-	-	1	-	-	7	SURVIVOR	-	Y	-	-	-	-
14	1555511	5	40	495	436	20	46	0	5	470	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
15	1557754	5	35	514	519	14	27	12	5	508	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
16	1558327	5	40	208	466	14	29	5	5	240	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
17	1558959	5	40	534	468	14	22	8	5	518	40	-	-	2	-	-	6	SURVIVOR	-	Y	-	-	-	-
18	1558365	5	40	454	466	25	61	0	5	436	40	-	-	6	-	-	28	SURVIVOR	-	Y	-	-	-	-
19	1558970	5	40	648	410	15	39	12	5	580	40	-	-	3	-	-	8	SURVIVOR	-	-	-	-	-	-
20	1560957	5	40	330	345	28	87	5	5	356	40	-	-	7	-	-	17	SURVIVOR	-	Y	-	-	-	-
21	1562513	5	40	343	414	44	120	0	5	358	40	Y	RESPIRATORY	12	-	-	24	SURVIVOR	-	Y	-	GOOD	126.4	101.9
22	1564672	5	40	392	424	35	87	8	5	370	40	Y	INC RR	6	-	-	12	-	NONSURVIVOR	Y	-	-	-	-
23	1566066	5	40	320	600	12	17	5	5	360	40	-	-	6	-	-	31	SURVIVOR	-	Y	-	-	-	-
24	1566983	5	40	276	419	17	39	5	5	300	40	-	-	10	-	-	24	SURVIVOR	-	Y	-	-	-	-
25	1569757	5	40	560	784	12	12	0	5	480	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
26	659099	5	40	242	375	17	39	0	5	220	40	-	-	2	-	-	11	SURVIVOR	-	Y	-	-	-	-
27	1576748	5	40	172	409	19	46	15	5	190	40	-	-	8	-	-	24	SURVIVOR	-	Y	-	-	-	-
28	1559468	5	40	260	601	22	36	0	5	280	40	-	-	4	-	-	13	SURVIVOR	-	Y	-	-	-	-
29	1542982	5	40	336	400	20	50	10	5	338	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
30	1572864	5	40	566	470	22	46	5	5	520	40	-	-	4	-	-	12	SURVIVOR	-	Y	-	-	-	-
31	1580622	5	40	384	565	15	30	0	5	400	40	-	-	1	-	-	8	SURVIVOR	-	Y	-	-	-	-
32	1584321	5	40	386	398	16	41	8	5	366	40	-	-	6	-	-	12	SURVIVOR	-	Y	-	-	-	-
33	1575931	5	40	424	329	20	60	0	5	412	40	-	-	2	-	-	5	SURVIVOR	-	Y	-	-	-	-
34	1588033	5	40	266	431	28	61	10	5	284	40	-	-	11	-	-	20	SURVIVOR	-	Y	-	-	-	-
35	1592330	5	40	560	641	11	19	0	5	564	40	-	-	2	-	-	6	SURVIVOR	-	Y	-	-	-	-
36	1552250	5	40	202	432	27	62	0	5	236	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
37	1593432	5	40	366	432	18	43	8	8	350	40	-	-	2	Y	-	7	SURVIVOR	-	Y	-	-	-	-
38	1491180	5	40	450	471	17	36	10	5	450	40	Y	INC RR	6	-	-	12	SURVIVOR	-	Y	-	GOOD	91.8	78.1
39	1583692	5	40	330	590	12	17	0	5	338	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
40	1587199	5	40	314	600	17	35	0	5	340	40	-	-	3	-	-	9	SURVIVOR	-	Y	-	-	-	-
41	1588829	5	40	276	412	24	58	0	5	266	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
42	1589135	5	40	250	311	21	60	0	5	254	40	-	-	5	-	-	9	SURVIVOR	-	Y	-	-	-	-
43	1592317	5	40	424	556	13	23	0	5	440	40	-	-	7	-	-	15	SURVIVOR	-	Y	-	-	-	-
44	1592335	5	40	494	520	17	41	5	5	480	40	-	-	6	-	-	11	SURVIVOR	-	Y	-	-	-	-
45	144579	5	40	280	530	20	37	6	5	294	40	Y	FLUID OVERLOAD	4	Y	-	12	SURVIVOR	-	Y	-	MODERATE	63.9	86.1
46	1595565	5	40	272	422	13	30	6	5	244	40	-	-	3	-	-	12	SURVIVOR	-	-	-	-	-	-
47	1552250	5	40	174	466	17	36	5	5	180	40	Y	INC HR/RR	4	Y	-	10	SURVIVOR	-	Y	-	-	-	-
48	1605032	5	40	358	369	23	51	0	5	344	40	-	-	2	-	-	6	SURVIVOR	-	Y	-	-	-	-
49	1605009	5	40	358	443	23	63	6	5	366	40	-	-	8	-	-	26	SURVIVOR	-	Y	-	-	-	-
50	1609244	5	40	398	303	19	62	0	5	414	40	Y	INTERMEDIATE SYN	8	-	-	12	SURVIVOR	-	Y	-	GOOD	101	144
51	871352	5	40	442	369	18	47	15	5	448	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
52	1581911	5	40	294	292	36	123	5	5	282	40	-	-	6	-	-	6	-	NONSURVIVOR	-	-	-	-	-

S No.	MRD	E/A	DCT(ms)	Lateral e' (cm/sec)	Lateral a' (cm/sec)	Septal e' (cm/sec)	SEPTAL a'(cm/sec)	Average e'	Average a'	E/e'	TAPSE (cm/sec)	IVC MAX_{DIA} (cm)	IVC MIN_{DIA} (cm)	IVC COMPRESSIBILTY (%)	IVC DISTENSIBILTY (%)	LV SYSTOLIC DYSFUNCTION	LV DIASTOLIC DYSFUNCTION (Grade)	RIGHT VENTRICULAR DYSFUNCTION
1	1464170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1527946	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	1527954	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	1535249	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1537076	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	1542361	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	1542362	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	1548695	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	1553257	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1554260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1554306	1.2	190	-	-	14.2	8.9	-	-	6.3	2.08	1.64	1.01	38.4	62	-	NORMAL	-
12	1554310	0.8	230	-	-	6.5	10.6	-	-	11.5	1.86	1.29	0.8	37	61	-	PSUEDONORMAL GRADE 2	-
13	1555412	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1555511	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1557754	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1558327	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1558959	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1558365	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1558970	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1560957	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1562513	1.24	210	-	-	13.2	10.5	-	-	9.57	2.08	1.26	0.54	57	133	-	INDETERMINATE	-
22	1564672	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1566066	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1566983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1569757	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	659099	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1576748	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1559468	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	1542982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	1572864	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	1580622	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	1584321	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	1575931	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	1588033	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	1592330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	1552250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	1593432	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	1491180	1.17	190	-	-	14.6	12.4	-	-	6.28	1.9	1.36	0.98	19	27	-	NORMAL	NORMAL
39	1583692	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	1587199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	1588829	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	1589135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	1592317	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44	1592335	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	144579	0.74	130	-	-	14.1	7.16	-	-	4.53	1.63	1.29	0.98	24	31	MODERATE	INDETERMINATE	Y
46	1595565	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
47	1552250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48	1605032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	1605009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	1609244	0.701	170	-	-	12.6	7.8	-	-	8	2.06	1.48	1.04	31	42	-	NORMAL	-
51	871352	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52	1581911	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

S No.	MRD	Date	Age (years)	Gender M/F	BMI KG/M^2	SOFA Score PRE SBT	SGA SCORE	CUMULATIVE FLUID BALANCE	NMB DRUG STEROIDS	COMORBIDITIES					SYSTEMIC DISEASES				BASELINE HEMODYNAMICS PRE SBT						
										DM	HTN	COPD	SMOKING	OTHERS	CARDIAC	RENAL	RESPIRATORY	ENDOCRINE	HR	SBP	DBP	MBP	RR	PH	PO2
53	1616056	4-Nov-23	60	M	20.4	6	4	0	-	Y	Y	-	-	-	-	-	-	-	82	133	69	94	14	7.37	144
54	1630443	29-Nov-23	19	M	19.4	6	3	550	-	-	-	-	-	-	-	-	-	-	108	118	70	78	18	7.38	238
55	1632148	3-Dec-23	38	M	24.9	3	5	685	-	-	-	-	-	-	-	-	-	-	97	115	70	88	15	7.38	236
56	1629231	3-Dec-23	34	M	26.8	3	5	2050	-	-	-	-	-	-	-	-	-	-	63	127	90	97	13	7.43	140
57	1632759	5-Dec-23	50	F	26.4	3	4	2200	-	-	-	-	-	-	-	-	-	-	77	125	77	85	14	7.45	91
58	1634282	8-Dec-23	55	M	28.9	4	6	1650	-	Y	Y	-	Y	-	-	Y	-	-	82	148	96	113	16	7.39	114
59	1635872	10-Dec-23	46	M	27.6	7	6	675	-	-	-	-	-	-	-	-	-	-	120	118	63	77	19	7.43	106
60	743102	11-Dec-23	54	M	21.7	6	4	480	-	-	Y	Y	Y	-	-	Y	-	-	75	154	72	95	16	7.4	120
61	1636450	11-Dec-23	49	M	26.1	6	5	-50	-	-	-	Y	Y	-	-	-	-	-	122	118	68	84	18	7.34	111
62	1635866	11-Dec-23	45	M	31.9	3	6	2300	-	-	-	-	-	-	-	-	-	-	104	151	97	111	18	7.37	197
63	1636384	12-Dec-23	26	M	23.8	3	5	1800	-	-	-	-	-	-	-	-	-	-	61	121	69	81	14	7.36	136
64	1636413	12-Dec-23	21	M	20.4	2	4	0	-	-	-	-	-	-	-	-	-	-	90	94	73	81	14	7.51	344
65	1492614	14-Dec-23	43	M	19.8	6	3	2684	-	-	-	-	-	-	-	-	-	-	67	122	83	91	15	7.52	146
66	1650249	9-Jan-24	35	F	27.6	2	4	780	-	-	-	-	-	-	-	-	-	-	77	132	86	105	14	7.4	218
67	1649557	10-Jan-24	39	F	23.2	2	5	5225	-	-	-	-	-	-	-	-	-	-	131	115	97	104	14	7.46	244
68	1649778	14-Jan-24	33	M	19.2	2	3	1030	-	-	-	-	-	-	-	-	-	-	66	133	65	87	18	7.52	144
69	1607231	14-Jan-24	30	M	26.1	2	5	3135	-	-	-	-	-	-	-	-	-	-	105	127	66	86	22	7.47	176
70	1653960	17-Jan-24	26	F	25.4	2	5	2025	-	-	-	-	-	-	-	-	-	-	70	125	88	101	17	7.42	113
71	1659675	28-Jan-24	40	M	22.6	5	4	275	-	-	-	-	-	-	-	-	-	-	64	130	79	93	14	7.49	136
72	1662486	2-Feb-24	28	F	18.6	2	2	-800	-	-	-	-	-	-	-	-	-	-	72	116	84	94	17	7.39	175
73	1662198	3-Feb-24	32	F	20.4	2	5	-355	-	-	-	-	-	-	-	-	-	-	60	110	79	67	16	7.48	87
74	1663245	4-Feb-24	34	M	24.8	4	5	1220	-	-	-	-	-	-	-	-	-	-	90	115	83	93	15	7.49	160
75	1664581	4-Feb-24	31	F	19.8	2	3	1790	-	-	-	-	-	-	-	-	-	-	105	130	92	96	19	7.43	197
76	1663407	6-Feb-24	21	M	26	6	6	3045	-	-	-	-	-	-	-	-	-	-	74	153	38	79	16	7.42	153
77	1667192	9-Feb-24	70	M	25.4	4	6	1500	-	-	-	-	-	-	-	-	-	-	102	112	60	78	22	7.37	215
78	1665679	11-Feb-24	40	f	28.8	4	5	1240	STEROID	-	-	-	-	-	-	-	-	Y	70	124	66	85	16	7.42	134
79	1652030	12-Feb-24	74	M	19.6	2	3	1400	-	Y	Y	Y	-	-	-	-	-	-	94	106	58	69	14	7.58	235
80	1669718	14-Feb-24	48	M	21.9	5	5	1180	-	-	-	-	-	-	-	-	-	-	113	102	60	75	14	7.52	190
81	1668243	15-Feb-24	49	M	23.9	4	4	150	-	-	-	Y	Y	-	-	-	ASTHMA	-	86	120	74	90	16	7.4	75
82	1671744	15-Feb-24	61	M	24.1	2	4	1125	-	-	Y	Y	-	-	-	-	-	-	62	117	73	79	14	7.42	239
83	550205	16-Feb-24	70	M	20.1	2	3	4250	-	-	-	-	Y	-	-	Y	-	-	114	126	84	98	22	7.51	163
84	1650755	18-Feb-24	70	F	21.6	2	5	1100	-	Y	Y	-	-	-	-	Y	-	-	97	137	75	96	14	7.48	130
85	1671906	18-Feb-24	70	M	23.4	2	5	1110	-	Y	Y	-	-	-	-	-	-	-	96	125	65	87	19	7.44	122
86	1671843	19-Feb-24	32	F	29.9	8	6	2435	-	-	-	-	-	-	-	-	-	-	102	148	93	106	18	7.38	206
87	1478561	20-Feb-24	36	F	38.4	6	6	1500	-	Y	-	-	-	-	-	-	Y	Y	79	168	96	120	18	7.46	107
88	1244779	21-Feb-24	62	M	23.7	5	6	335	-	-	-	-	-	-	-	Y	-	-	84	120	76	90	17	7.42	96
89	1678148	23-Feb-24	29	F	30.8	2	4	30	-	-	-	-	-	-	-	-	-	-	120	140	78	98	18	7.31	201
90	1646402	28-Feb-24	68	F	19.5	2	3	260	-	Y	Y	-	-	-	-	Y	-	-	72	107	62	78	14	7.4	199
91	1685232	4-Mar-24	70	M	18.8	6	3	1600	-	Y	Y	-	-	-	-	-	-	-	77	139	99	113	17	7.37	236
92	1690174	13-Mar-24	34	M	23.4	4	5	800	-	-	-	-	-	-	-	-	-	-	127	122	79	84	16	7.45	221
93	1679231	16-Mar-24	56	M	23.7	4	4	-370	-	-	-	Y	Y	-	-	-	-	-	108	110	73	85	16	7.53	164
94	1679830	19-Mar-24	38	M	21.5	4	6	1135	-	-	-	-	Y	-	-	-	-	-	106	127	82	97	18	7.35	202
95	1687848	20-Mar-24	70	F	20.6	2	5	-600	-	Y	Y	-	-	-	-	-	-	-	85	130	76	94	14	7.56	131
96	1695254	21-Mar-24	23	M	20.1	2	3	5420	-	-	-	-	-	-	-	-	-	-	80	124	75	88	16	7.46	172
97	1651985	21-Mar-24	58	F	22.6	6	6	170	-	Y	Y	-	-	-	-	Y	-	Y	60	138	88	104	18	7.35	97
98	1703503	2-Apr-24	48	F	21.7	2	4	2732	-	-	-	-	-	-	-	-	-	-	77	93	60	72	15	7.45	171
99	1705718	4-Apr-24	45	F	19.5	4	3	2125	-	-	Y	-	-	-	-	-	-	-	86	103	79	87	16	7.42	198
100	1703239	5-Apr-24	49	F	30.2	4	6	1640	-	Y	Y	-	-	-	-	-	-	-	98	116	77	88	18	7.47	193
101	1704572	6-Apr-24	25	M	21.2	2	4	1260	-	-	-	-	-	-	-	-	-	-	100	122	65	85	16	7.45	225
102	1664841	6-Apr-24	24	M	22.6	2	4	240	-	-	-	-	-	-	-	-	-	-	78	116	54	76	15	7.3	174
103	1664178	6-Apr-24	42	M	24.8	4	4	300	-	-	-	-	-	-	-	-	-	-	95	106	64	84	18	7.4	175
104	1713884	15-Apr-24	40	M	23.8	4	4	830	-	-	-	-	-	-	-	-	-	-	75	103	67	75	15	7.41	134

S No.	MRD	BASELINE ABG PRE SBT				REASON FOR MECHANCIAL VENTILATION(MV)					DURATION OF MV								
						POST	NEURO	ALI/ or	SEPSIS	OTHER									
		PCO2	HCO3	LACTATE	GLUCOSE	SURGICAL	TRAUMA	LUNG INFECTION			PRE SBT	LVEF	E (cm/sec)	A (cm/sec)	E/A	DCT(ms)	Lateral e'(cm/sec)	Lateral a'(cm/sec)	Septal e'(cm/sec)
53	1616056	32	18.8	2.4	124	Y	-	-	-	-	1	MILD	78.2	75.4	1.03	210	-	-	8.98
54	1630443	38	27.1	1.3	110	-	Y	-	-	-	14	GOOD	96.2	93.3	1.03	120	-	-	12.6
55	1632148	36	22.4	2.4	99	Y	-	-	-	-	1	GOOD	73.2	65.3	1.12	190	-	-	12.6
56	1629231	38	24.5	0.8	166	Y	-	-	-	-	3	GOOD	71.1	66.8	1.06	300	-	-	18.8
57	1632759	33	22.9	1.4	140	Y	-	-	-	-	2	GOOD	69.6	86.9	0.8	250	-	-	8.85
58	1634282	34	20.6	1.2	98	Y	-	-	-	-	2	GOOD	66.8	61	0.89	230	-	-	11.3
59	1635872	38	25.2	1.8	196	Y	-	-	-	-	3	SEVERE	102.7	86.9	1.18	150	-	-	12.2
60	743102	39	24.2	1.3	134	Y	-	-	-	-	2	GOOD	66.8	61	1.09	230	-	-	11.3
61	1636450	34	20.2	1.2	165	Y	-	-	-	-	1	GOOD	73.9	84	0.87	130	-	-	10.2
62	1635866	36	20.8	2.9	117	-	Y	-	-	-	3	GOOD	79.7	76.8	1.03	220	-	-	12.2
63	1636384	36	24.2	1.3	102	-	Y	-	-	-	3	GOOD	92.6	64.6	1.43	140	-	-	9.77
64	1636413	34	27.1	1.1	97	-	Y	-	-	-	2	MILD	69.6	74.7	0.93	140	-	-	8.72
65	1492614	37	30.2	1.6	142	Y	-	-	-	-	3	GOOD	98.3	68.9	1.42	220	-	-	13
66	1650249	30	18.6	1.3	76	Y	-	-	-	-	1	MILD	79.6	62.5	1.27	180	-	-	10
67	1649557	30	21.3	0.6	119	Y	-	-	-	-	1	GOOD	94.8	73.2	1.29	105	-	-	14.3
68	1649778	39	31.8	0.9	117	Y	-	-	-	-	2	GOOD	89.7	75.6	1.18	150	-	-	16.6
69	1607231	31	24.3	1.9	115	Y	-	-	-	-	2	GOOD	102.7	74.7	1.37	115	-	-	12.8
70	1653960	31	20.1	0.9	115	Y	-	-	-	-	1	GOOD	86.1	79	1.08	170	-	-	11.8
71	1659675	34	25.9	1.5	129	Y	Y	-	-	-	4	GOOD	78.9	59.5	1.32	230	-	-	14.5
72	1662486	36	21.8	1.1	121	Y	-	-	-	-	1	GOOD	115.6	71.8	1.61	190	-	-	15.4
73	1662198	39	20.6	0.9	173	Y	-	-	-	-	1	GOOD	100.5	65.3	1.53	170	-	-	12
74	1663245	29	22.1	1.6	118	Y	-	-	-	-	2	GOOD	73.2	69.6	1.05	190	-	-	10.8
75	1664581	38	25.2	1.1	166	Y	-	-	-	-	1	MILD	76.1	86.9	0.87	130	6.9	11.3	7.29
76	1663407	38	24.6	0.9	102	-	Y	-	-	-	4	GOOD	89	74.7	1.19	210	-	-	14.2
77	1667192	31	17.9	1.9	177	Y	-	-	-	-	1	GOOD	77.5	66	1.1	240	-	-	10.8
78	1665679	32	21.2	0.8	163	Y	-	-	-	-	2	GOOD	60	82.5	71	240	-	-	12.8
79	1652030	36	33.8	1.6	260	Y	-	-	-	-	3	SEVERE	80.4	86.1	0.93	160	-	-	12.8
80	1669718	36	29.4	1.9	116	-	Y	-	-	-	2	SEVERE	72.5	51	1.42	270	-	-	13.4
81	1668243	46	32.5	0.6	108	Y	-	-	-	-	3	GOOD	80.4	66.8	1.2	280	-	-	15
82	1671744	36	23.4	2	139	Y	Y	-	-	-	2	GOOD	83.2	75.6	1.1	210	-	-	13.2
83	550205	49	39.1	1.4	240	-	-	-	-	AECOPD	3	GOOD	77	69.8	1.1	230	-	-	7.42
84	1650755	46	34.3	1.6	174	Y	-	-	-	-	4	MODERATE	132	115	1.14	160	-	-	9.25
85	1671906	36	24.5	1.9	177	Y	-	-	-	-	1	GOOD	96.2	87.6	1.09	230	-	-	7.03
86	1671843	33	19.5	0.7	212	Y	-	-	-	-	1	GOOD	82.6	66	1.25	230	-	-	10.7
87	1478561	48	34.1	1.3	220	-	-	Y	-	-	2	GOOD	119.9	83.3	1.43	220	-	-	16
88	1244779	37	24	0.9	154	Y	-	-	-	-	1	GOOD	68.9	61	1.12	210	-	-	8.29
89	1678148	40	23.3	1.4	117	Y	-	-	-	-	1	MODERATE	99.8	109.2	0.91	160	-	-	13
90	1646402	34	21	1.4	170	Y	-	-	-	-	1	GOOD	84	110.5	0.76	290	-	-	5.08
91	1685232	32	18.5	1	121	Y	-	-	-	-	2	GOOD	67.5	66.8	1.01	280	-	-	5.88
92	1690174	38	26.4	1.1	125	Y	-	-	-	-	1	GOOD	56	73.2	0.76	100	-	-	10.9
93	1679231	44	28.6	1.2	106	-	-	Y	-	-	4	SEVERE	77.6	83.8	0.92	150	-	-	10.8
94	1679830	33	18.2	2.6	221	Y	-	-	Y	-	2	GOOD	58.9	53.8	1.094	150	-	-	9.79
95	1687848	30	26.9	1.4	110	Y	-	-	-	-	2	GOOD	93.3	147.9	0.63	180	-	-	5.86
96	1695254	40	28.3	0.8	172	Y	Y	-	-	-	3	GOOD	90.4	71.1	1.27	180	-	-	13.5
97	1651985	34	18.8	1	89	-	-	Y	-	-	5	GOOD	104.8	101.9	1.02	220	-	-	7.42
98	1703503	32	22.2	2.2	218	Y	-	-	-	-	3	GOOD	90.4	87.6	1.03	240	-	-	8.33
99	1705718	36	21.1	0.6	129	Y	-	-	-	-	1	MILD	45.9	73.2	0.62	100	7.68	6.9	4.69
100	1703239	40	28	1.1	147	-	Y	-	-	-	4	GOOD	104.1	86.1	1.2	250	-	-	13.2
101	1704572	48	33.4	0.9	108	Y	Y	-	-	-	5	GOOD	85.6	81.8	1.046	210	-	-	12.8
102	1664841	30	18.8	0.5	138	-	Y	-	-	-	1	GOOD	99.8	55.3	1.8	250	-	-	15
103	1664178	38	23.5	1.3	188	-	Y	-	-	-	3	GOOD	79	76.8	1.02	210	-	-	10
104	1713884	41	26	0.8	116	Y	-	-	-	-	2	MILD	65.3	40.2	1.62	270	-	-	10.3

S No.	MRD	PRE SBT											
		SEPTAL a'(cm/sec)	Average e'	Average a'	E/e'	TAPSE(cm/sec)	IVC MAX_{DIA} (cm)	IVC MIN_{DIA} (cm)	IVC COMPRESSIBILTY (%)	IVC DISTENSIBILTY (%)	DIURETICS USE	LV SYSTOLIC DYSFUNCTION
53	1616056	8.85	-	-	8.78	1.89	1.01	0.63	37.6	60	-	MILD
54	1630443	10.9	-	-	7.64	2.58	0.95	0.44	53.7	115	Y	-
55	1632148	9.9	-	-	5.8	2.65	1.95	1.51	22.6	29	-	-
56	1629231	6.25	-	-	3.78	2.15	2	1.63	22.5	22	-	-
57	1632759	10.2	-	-	7.86	1.82	1.61	0.98	41.6	64	-	-
58	1634282	9.38	-	-	5.91	2.07	1.7	0.96	43.5	77	-	-
59	1635872	6.9	-	-	8.41	2.15	1.85	1.55	20	19	-	SEVERE
60	743102	9.38	-	-	5.91	2.07	1.7	0.96	43.5	77	-	-
61	1636450	15.9	-	-	7.24	1.83	1.93	1.48	23.3	30	-	-
62	1635866	9.51	-	-	6.53	2.22	1.87	1.44	23	29	-	-
63	1636384	7.94	-	-	9.47	2.27	1.89	1.45	23.3	30	Y	-
64	1636413	6.38	-	-	7.98	1.98	1.35	0.82	39.3	64	-	MILD
65	1492614	14.8	-	-	7.56	1.76	1.51	1.13	25.1	33	-	-
66	1650249	7.16	-	-	7.96	2.08	1.58	1.32	16	19	-	MILD
67	1649557	3.26	-	-	6.6	1.46	1.39	0.82	41	69	-	-
68	1649778	7	-	-	5.4	1.83	1.7	1.2	29.4	41	-	-
69	1607231	6.45	-	-	8	2.37	1.41	0.84	36.2	67	-	-
70	1653960	6.39	-	-	7.29	2.02	1.45	0.95	34.5	52	-	-
71	1659675	8.84	-	-	5.44	1.96	1.08	0.7	35	54	-	-
72	1662486	7.16	-	-	7.5	1.89	1.7	1.32	22.4	28	-	-
73	1662198	8.5	-	-	8.37	2.12	1.51	0.88	41.7	71	-	-
74	1663245	6.25	-	-	6.7	2.27	1.83	1.32	27.9	38	-	-
75	1664581	2.08	7.095	6.69	10.7	1.61	1.77	1.3	26.6	36	Y	MILD
76	1663407	5.08	-	-	6.26	1.83	1.83	1.64	10.4	11	Y	-
77	1667192	4.56	-	-	7.17	1.58	2.52	2.15	14.7	17	Y	-
78	1665679	6.7	-	-	6.44	1.8	1.43	0.84	41	70	-	-
79	1652030	8.07	-	-	6.28	1.93	1.55	0.89	42.6	74	Y	SEVERE
80	1669718	12.2	-	-	5.41	2.02	1.23	1.23	39	64	Y	SEVERE
81	1668243	10.4	-	-	5.36	1.76	1.83	0.82	55.2	123	-	-
82	1671744	9.9	-	-	6.3	2.05	1.76	1.28	27	37.5	Y	-
83	550205	10.3	-	-	7.47	1.76	1.58	0.69	56.3	128	-	-
84	1650755	4.3	-	-	14.2	1.58	2.27	1.45	36.1	56	Y	MODERATE
85	1671906	9.64	-	-	13.6	1.85	1.35	0.98	27	37	-	-
86	1671843	7.81	-	-	7.71	1.95	1.95	1.58	19	23	Y	-
87	1478561	5.6	-	-	7.49	2.07	2.3	1.55	32.6	48	Y	-
88	1244779	7.29	-	-	7.7	2.02	0.82	0.38	53	115	-	-
89	1678148	6.51	-	-	7.6	1.76	1.32	0.92	37.9	43	Y	MODERATE
90	1646402	6.77	-	-	16.5	1.51	1.75	1.26	28.4	38	-	-
91	1685232	8.98	-	-	7.516	1.89	0.88	0.44	50	100	-	-
92	1690174	8.72	-	-	5.13	1.58	1.78	1.26	25.9	41	-	-
93	1679231	8.6	-	-	7.185	1.7	1.36	0.84	38	61	-	SEVERE
94	1679830	9.38	-	-	6.01	1.7	1.59	1.01	36	57	Y	-
95	1687848	6.9	-	-	13.5	1.2	1.45	0.88	39.3	64	-	-
96	1695254	7.81	-	-	6.69	2.08	1.38	0.76	45.3	82	-	-
97	1651985	6.38	-	-	14.12	2.07	2.52	1.26	50	100	Y	-
98	1703503	7.55	-	-	10.85	1.83	1.07	0.32	70	234	-	-
99	1705718	8.2	6.185	7.55	7.42	1.64	0.99	0.25	73.7	29	-	MILD
100	1703239	12.2	-	-	7.88	2.14	1.76	1.2	31.8	46	-	-
101	1704572	9.6	-	-	6.68	1.9	1.36	0.92	32	47	-	-
102	1664841	8.2	-	-	6.6	2.02	1.39	0.63	54.7	120	-	-
103	1664178	7.68	-	-	7.9	1.8	1.32	0.82	37.9	60	-	-
104	1713884	8.07	-	-	6.33	1.83	2.71	1.95	28	38	Y	MILD

S No.	MRD	ECHO ASSESSMENT											
		LV DIASTOLIC DYSFUNCTION (Grade)	RIGHT VENTRICULAR DYSFUNCTION	LVEF	E (cm/sec)	A (cm/sec)	E/A	DCT(ms)	Lateral e'(cm/sec)	Lateral a'(cm/sec)	SEPTAL e'(cm/sec)	SEPTAL a'(cm/sec)	Average e'
53	1616056	INDETERMINATE	-	MILD	101.9	92.6	1.1	170	-	-	12	10.2	-
54	1630443	NORMAL	-	GOOD	87.6	101.2	0.86	140	-	-	17.2	10	-
55	1632148	NORMAL	-	GOOD	60.3	58.1	1.03	200	-	-	13.4	10	-
56	1629231	NORMAL	-	GOOD	78.2	39.5	1.97	230	-	-	19.8	7.94	-
57	1632759	NORMAL	-	GOOD	66.8	79.7	0.83	210	-	-	12.77	13.9	-
58	1634282	NORMAL	-	GOOD	84.6	72.5	1.1	180	-	-	12.8	8.5	-
59	1635872	INDETERMINATE	-	SEVERE	119.9	101.2	1.18	200	-	-	14.7	6.77	-
60	743102	NORMAL	-	GOOD	73.9	50.2	1.47	200	-	-	12.6	12.8	-
61	1636450	NORMAL	-	GOOD	83.9	93.3	0.89	100	-	-	12.9	14.8	-
62	1635866	NORMAL	-	GOOD	94.8	67.5	1.4	220	-	-	16.1	10.2	-
63	1636384	INDETERMINATE	-	GOOD	113.4	76.8	1.47	230	-	-	14.8	8.54	-
64	1636413	NORMAL	-	MILD	78.8	92.6	0.85	180	-	-	10.4	8.14	-
65	1492614	NORMAL	-	GOOD	108.6	90.2	1.28	180	-	-	13.6	11	-
66	1650249	NORMAL	-	MILD	66	66	1	155	-	-	12.8	10.8	-
67	1649557	NORMAL	Y	GOOD	111.3	78.2	1.42	185	-	-	19.3	18.2	-
68	1649778	NORMAL	-	GOOD	96.2	54.6	1.76	135	-	-	14.3	8.79	-
69	1607231	NORMAL	-	GOOD	100.5	96.9	1.03	140	-	-	13.1	8.68	-
70	1653960	NORMAL	-	GOOD	161.9	84.4	1.9	110	-	-	12.2	12.6	-
71	1659675	NORMAL	-	GOOD	91.1	68.6	1.32	190	-	-	16.6	9.2	-
72	1662486	NORMAL	-	GOOD	118.5	61.8	1.91	250	-	-	10.7	7.94	-
73	1662198	INDETERMINATE	-	GOOD	91.2	61.7	1.47	240	-	-	13.3	12.5	-
74	1663245	NORMAL	-	GOOD	103.4	76.8	1.34	160	-	-	15.5	10.3	-
75	1664581	PSUEDONORMAL	Y	MILD	112.7	110	1.02	110	12.2	8.72	13.2	4.95	12.7
76	1663407	NORMAL	-	GOOD	94.8	62.5	1.51	310	-	-	14.5	4.56	-
77	1667192	NORMAL	Y	GOOD	90.4	60.1	1.5	230	-	-	12.9	4.45	-
78	1665679	NORMAL	-	GOOD	96.4	66	1.46	210	-	-	14.9	6.45	-
79	1652030	NORMAL	-	SEVERE	85.8	91.2	0.928	120	-	-	8.07	7.03	-
80	1669718	NORMAL	-	SEVERE	84.7	110.5	0.76	210	-	-	12.1	11.8	-
81	1668243	NORMAL	-	GOOD	112.7	77.5	1.45	210	-	-	13.9	10.8	-
82	1671744	NORMAL	-	GOOD	86.8	82.5	1.05	200	-	-	11.35	10.6	-
83	550205	INDETERMINATE	-	GOOD	71.1	86.1	0.82	150	-	-	8.2	8.46	-
84	1650755	INDETERMINATE	Y	MODERATE	63.2	114.1	0.55	280	-	-	8.78	9.37	-
85	1671906	PSUEDONORMAL	-	GOOD	99.1	79.7	1.24	200	-	-	11.7	10.5	-
86	1671843	NORMAL	-	GOOD	116.3	68.3	1.7	220	-	-	11.2	7.68	-
87	1478561	NORMAL	-	GOOD	109.8	108.4	1.01	250	-	-	13.2	7.55	-
88	1244779	INDETERMINATE	-	GOOD	58	56	1.03	250	-	-	8.48	7.29	-
89	1678148	NORMAL	-	MODERATE	107	114.1	0.93	140	-	-	11.3	4.56	-
90	1646402	INDETERMINATE	Y	GOOD	74.7	104.8	0.71	250	-	-	4.95	6.64	-
91	1685232	INDETERMINATE	-	GOOD	72.5	73.2	0.99	270	-	-	7.29	10.3	-
92	1690174	INDETERMINATE	Y	GOOD	58.9	75.4	0.78	170	-	-	9.9	8.07	-
93	1679231	NORMAL	-	SEVERE	88.7	96.6	0.91	110	-	-	10.2	7.8	-
94	1679830	NORMAL	-	GOOD	53	61	0.88	180	-	-	9.51	9.11	-
95	1687848	INDETERMINATE	Y	GOOD	104.1	136.4	0.76	220	-	-	10.8	16.7	-
96	1695254	NORMAL	-	GOOD	105.5	91.9	1.14	270	-	-	13.8	11.1	-
97	1651985	PSUEDONORMAL	-	GOOD	117.7	106.2	1.1	220	-	-	11.1	6.77	-
98	1703503	INDETERMINATE	-	GOOD	93.3	89.7	1.04	270	-	-	8.72	8.59	-
99	1705718	1	Y	MILD	43.1	55.3	0.77	170	8.59	8.07	5.86	5.34	7.22
100	1703239	NORMAL	-	GOOD	91.2	83.3	1.09	220	-	-	12.2	8.46	-
101	1704572	NORMAL	-	GOOD	97.6	78.9	1.23	220	-	-	13.2	9.6	-
102	1664841	NORMAL	-	GOOD	103.4	84	1.23	250	-	-	15.9	10.3	-
103	1664178	NORMAL	-	GOOD	92.7	82.6	1.12	210	-	-	7.94	7.81	-
104	1713884	NORMAL	-	MILD	55.3	38.8	1.42	290	-	-	10.2	7.55	-

S No.	MRD	POST SBT										V		
		Average a'	E/e'	TAPSE(cm/sec)	IVC MAX $_{DIA}$ (cm)	IVC MIN $_{DIA}$ (cm)	IVC COMPRESSIBILTY (%)	IVC DISTENSIBILTY (%)	LV SYSTOLIC DYSFUNCTION	LV DIASTOLIC DYSFUNCTION	RV SYSTOLIC DYSFUNCTION	TV	RR	RSBI
53	1616056	-	8.49	1.83	1.39	1.01	27.3	37	MILD	INDETERMINATE	-	525	14	26
54	1630443	-	5.09	1.95	1.2	0.57	52.5	110	-	NORMAL	-	473	15	34
55	1632148	-	4.5	2.2	1.58	1.26	20.3	25	-	NORMAL	-	480	16	36
56	1629231	-	3.94	2.37	1.55	1.26	20	23	-	NORMAL	-	449	13	29
57	1632759	-	5.25	2.29	1.2	0.47	60	155	-	NORMAL	-	484	15	31
58	1634282	-	2.1	2.1	1.76	0.84	52.2	109.5	-	NORMAL	-	450	16	36
59	1635872	-	8.15	2.67	1.78	1.33	25.3	33	SEVERE	INDETERMINATE	-	473	19	40
60	743102	-	5.86	1.87	2.15	1.93	10.2	11	-	NORMAL	-	540	18	34
61	1636450	-	6.5	1.9	1.83	0.88	51	107	-	NORMAL	-	517	17	33
62	1635866	-	5.88	1.78	1.48	0.81	47.7	82	-	NORMAL	-	490	16	32
63	1636384	-	7.66	1.95	1.63	1.18	27.6	38	-	NORMAL	-	475	14	29
64	1636413	-	7.57	2.02	1.46	1.09	25	33	MILD	NORMAL	-	464	14	30
65	1492614	-	7.2	1.8	1.76	1.22	30	44	-	NORMAL	-	500	15	30
66	1650249	-	5.15	2.21	1.01	0.32	68.3	215	MILD	NORMAL	-	440	14	32
67	1649557	-	5.76	1.51	1.32	0.82	37	60	-	NORMAL	Y	514	14	27
68	1649778	-	6.72	2.33	1.39	0.95	31.7	46	-	NORMAL	-	385	16	42
69	1607231	-	7.67	2.02	1.32	0.69	47.7	91	-	NORMAL	-	501	22	44
70	1653960	-	13.2	2.33	1.83	1.01	44.8	81	-	INDETERMINATE	-	450	17	38
71	1659675	-	5.48	1.86	1.12	0.66	41	69.6	-	NORMAL	-	450	18	40
72	1662486	-	11.07	2.52	1.89	1.07	43.4	76	-	INDETERMINATE	-	416	16	39
73	1662198	-	6.8	2.39	1.45	0.95	34.5	52	-	NORMAL	-	450	16	36
74	1663245	-	6.6	1.76	1.64	0.82	50	100	-	NORMAL	-	523	15	28
75	1664581	6.8	8.8	1.51	1.46	0.99	32.2	47	MILD	INDETERMINATE	Y	394	20	50
76	1663407	-	6.53	2.21	1.76	1.07	39.2	64	-	NORMAL	-	532	17	32
77	1667192	-	7	1.39	1.83	1.2	34.4	52	-	NORMAL	Y	559	24	42
78	1665679	-	6.46	2	1.56	0.97	37	60	-	NORMAL	-	450	16	36
79	1652030	-	10.49	1.51	1.32	0.76	42.4	73	SEVERE	INDETERMINATE	Y	450	15	34
80	1669718	-	7	2.52	2.08	1.58	24	31	SEVERE	INDETERMINATE	-	450	12	27
81	1668243	-	8.1	2.08	1.95	0.63	67.7	209	-	INDETERMINATE	-	500	15	30
82	1671744	-	7.64	2.18	1.96	1.34	31	46	-	NORMAL	-	474	14	29
83	550205	-	8.74	1.83	1.07	0.44	58.9	143	-	INDETERMINATE	-	471	22	46
84	1650755	-	7.19	1.82	1.64	1.07	34.8	53	MODERATE	1	-	475	14	29
85	1671906	-	8.47	1.93	1.83	1.39	24	31	-	INDETERMINATE	-	500	18	36
86	1671843	-	10.38	2.02	1.82	1.43	21	27	-	INDETERMINATE	-	464	18	38
87	1478561	-	8.31	1.85	1.48	0.89	39.9	66	-	INDETERMINATE	-	475	16	34
88	1244779	-	6.83	1.83	0.44	0.32	27.3	37	-	NORMAL	-	450	17	38
89	1678148	-	9.46	2.02	1.26	0.69	45.2	45	MODERATE	INDETERMINATE	-	490	17	35
90	1646402	-	15.09	1.89	1.83	1.42	22	28	-	INDETERMINATE	-	416	14	34
91	1685232	-	9.94	1.83	0.5	0.19	62	163	-	PSUEDONORMAL	-	450	17	38
92	1690174	-	5.94	2.02	1.39	0.82	41	69	-	INDETERMINATE	-	438	16	37
93	1679231	-	8.69	1.86	1.22	0.86	29.5	41	SEVERE	INDETERMINATE	-	440	18	40
94	1679830	-	5.65	1.7	1.11	0.59	46.8	88	-	NORMAL	-	443	19	42
95	1687848	-	10.44	1.39	1.76	1	42.6	74	-	INDETERMINATE	Y	450	12	27
96	1695254	-	7.64	2.27	1.89	1.01	46.6	87	-	NORMAL	-	500	16	32
97	1651985	-	10.6	1.76	1.95	1.01	48.2	93	-	INDETERMINATE	-	450	14	32
98	1703503	-	10.86	1.89	1.01	0.38	62.4	165	-	INDETERMINATE	-	450	14	32
99	1705718	6.7	5.9	1.45	0.69	0.32	53.6	115	MILD	1	Y	450	17	38
100	1703239	-	7.8	2.21	1.7	1.2	29.4	41	-	NORMAL	-	450	16	36
101	1704572	-	7.39	2.1	1.29	0.86	33	50	-	NORMAL	-	446	16	36
102	1664841	-	6.5	2.21	1.83	0.63	65.6	190	-	NORMAL	-	450	15	34
103	1664178	-	11.6	2	1.26	0.88	30.2	43	-	PSUEDONORMAL	-	436	19	43
104	1713884	-	5.42	1.7	2.58	2.21	12	16	-	NORMAL	-	454	15	33

S No.	MRD	VENTILATOR PARAMETERS/WEANING PARAMETERS										SBT	REASON	DURATION OF VENTILATOR DAYS	NIV USED	REINTUBATION	DURATION OF ICU DAYS	28 DAY OUTCOME		INCLUDED	EXCLUDED	LVEF	E (cm/sec)	A (cm/sec)
		PRE SBT			POST SBT																			
		PEEP	FiO2	PaO_2/FIO_2	TV	RR	RSBI	PS	PEEP	PaO_2/FIO_2	FIO_2	FAILURE						SURVIVOR	NONSURVIVOR					
53	1616056	5	40	288	617	17	31	0	5	280	40	-	-	1	-	-	6	SURVIVOR	-	Y	-	-	-	-
54	1630443	5	40	476	367	17	46	8	5	450	40	-	-	18	-	-	28	SURVIVOR	-	Y	-	-	-	-
55	1632148	5	40	472	413	18	46	6	5	448	40	-	-	1	-	-	7	SURVIVOR	-	Y	-	-	-	-
56	1629231	5	40	280	450	16	36	5	5	294	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
57	1632759	5	40	182	401	19	54	6	5	190	40	-	-	2	-	-	6	SURVIVOR	-	Y	-	-	-	-
58	1634282	5	40	228	394	22	56	6	5	260	40	-	-	2	-	-	6	SURVIVOR	-	Y	-	-	-	-
59	1635872	5	40	212	544	20	44	5	5	248	40	-	-	8	-	-	14	-	NONSURVIVOR	Y	-	-	-	-
60	743102	5	40	240	472	14	30	5	5	230	40	-	-	3	Y	-	6	-	NONSURVIVOR	Y	-	-	-	-
61	1636450	5	40	222	685	19	33	5	5	230	40	-	-	2	-	-	7	SURVIVOR	-	Y	-	-	-	-
62	1635866	5	40	394	483	19	25	5	5	386	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
63	1636384	5	40	272	460	19	41	5	5	274	40	-	-	4	-	-	9	SURVIVOR	-	Y	-	-	-	-
64	1636413	5	40	688	434	18	41	0	5	580	40	-	-	1	-	-	6	SURVIVOR	-	Y	-	-	-	-
65	1492614	5	40	292	476	20	43	6	5	268	40	-	-	4	-	-	10	SURVIVOR	-	Y	-	-	-	-
66	1650249	5	40	436	432	18	41	0	5	378	40	-	-	2	-	-	5	SURVIVOR	-	Y	-	-	-	-
67	1649557	5	40	610	375	16	39	0	5	566	40	-	-	1	-	-	5	SURVIVOR	-	Y	-	-	-	-
68	1649778	5	40	288	480	16	34	5	5	300	40	-	-	1	-	-	7	SURVIVOR	-	Y	-	-	-	-
69	1607231	5	40	352	397	30	74	0	5	330	40	-	-	2	-	-	6	-	NONSURVIVOR	Y	-	-	-	-
70	1653960	5	40	254	346	33	97	6	5	280	40	-	-	2	Y	-	4	SURVIVOR	-	Y	-	-	-	-
71	1659675	5	40	272	447	17	32	10	5	260	40	-	-	4	-	-	10	SURVIVOR	-	Y	-	-	-	-
72	1662486	5	40	350	450	18	40	0	5	340	40	-	-	2	-	-	4	SURVIVOR	-	Y	-	-	-	-
73	1662198	5	40	174	468	16	38	0	5	190	40	-	-	1	-	-	4	SURVIVOR	-	Y	-	-	-	-
74	1663245	5	40	320	434	14	32	0	5	310	40	-	-	2	-	-	5	SURVIVOR	-	Y	-	-	-	-
75	1664581	5	40	394	281	27	96	0	5	362	40	-	-	2	Y	-	4	SURVIVOR	-	Y	-	-	-	-
76	1663407	5	40	306	623	20	35	6	5	350	40	-	-	6	-	-	10	SURVIVOR	-	Y	-	-	-	-
77	1667192	5	40	430	414	21	45	5	5	470	40	-	-	3	-	-	12	SURVIVOR	-	Y	-	-	-	-
78	1665679	5	40	335	416	22	52	8	5	340	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
79	1652030	5	40	470	602	11	18	8	5	460	40	-	-	6	-	-	6	-	NONSURVIVOR	Y	-	-	-	-
80	1669718	5	40	380	551	30	72	12	5	400	40	-	-	3	Y	-	8	SURVIVOR	-	Y	-	-	-	-
81	1668243	5	40	150	475	20	41	10	5	180	40	-	-	6	Y	-	15	SURVIVOR	-	Y	-	-	-	-
82	1671744	5	40	478	470	15	15	12	5	460	40	-	-	3	Y	-	12	SURVIVOR	-	Y	-	-	-	-
83	550205	5	40	326	402	18	45	5	5	368	40	-	-	5	-	-	13	SURVIVOR	-	Y	-	-	-	-
84	1650755	5	40	274	552	14	30	8	5	300	40	-	-	7	-	-	11	SURVIVOR	-	Y	-	-	-	-
85	1671906	5	40	244	577	19	36	5	5	260	40	-	-	2	-	-	2	-	NONSURVIVOR	Y	-	-	-	-
86	1671843	5	40	412	460	20	43	5	5	390	40	-	-	1	-	-	8	SURVIVOR	-	Y	-	-	-	-
87	1478561	5	40	268	597	15	28	12	5	260	40	-	-	3	Y	-	12	SURVIVOR	-	Y	-	-	-	-
88	1244779	5	40	192	463	15	36	0	5	210	40	-	-	3	-	-	10	SURVIVOR	-	Y	-	-	-	-
89	1678148	6	40	402	645	18	26	0	5	422	40	-	-	1	-	-	6	SURVIVOR	-	Y	-	-	-	-
90	1646402	5	40	398	415	19	46	12	5	404	40	-	-	2	-	-	7	SURVIVOR	-	Y	-	-	-	-
91	1685232	5	40	472	388	23	62	5	5	490	40	-	-	2	-	-	9	SURVIVOR	-	Y	-	-	-	-
92	1690174	5	40	442	480	14	33	0	5	480	40	-	-	1	-	-	5	SURVIVOR	-	Y	-	-	-	-
93	1679231	5	40	410	380	26	68	10	5	380	40	Y	SEVERE LV DYSFU	6	Y	-	12	SURVIVOR	-	Y	-	SEVERE	88.7	96.6
94	1679830	5	40	404	611	22	23	5	5	450	40	-	-	2	-	-	18	SURVIVOR	-	Y	-	-	-	-
95	1687848	5	40	262	404	14	26	12	6	288	40	-	-	3	-	-	9	SURVIVOR	-	Y	-	-	-	-
96	1695254	5	40	354	516	21	50	0	5	386	40	-	-	3	-	-	10	SURVIVOR	-	Y	-	-	-	-
97	1651985	5	40	323	416	17	39	8	5	320	40	-	-	8	-	-	26	SURVIVOR	-	Y	-	-	-	-
98	1703503	5	40	342	353	14	38	10	5	360	40	-	-	4	-	-	11	SURVIVOR	-	Y	-	-	-	-
99	1705718	5	40	398	392	20	60	8	5	380	40	-	-	2	-	-	6	SURVIVOR	-	Y	-	-	-	-
100	1703239	5	40	386	419	23	58	12	5	388	40	-	-	7	-	-	21	SURVIVOR	-	Y	-	-	-	-
101	1704572	5	40	450	450	18	40	0	5	460	40	-	-	6	-	-	15	SURVIVOR	-	Y	-	-	-	-
102	1664841	5	40	348	500	16	32	0	5	370	40	-	-	3	-	Y	24	SURVIVOR	-	Y	-	GOOD	91	58
103	1664178	5	40	350	422	21	45	0	5	346	40	-	-	4	-	-	10	SURVIVOR	-	Y	-	-	-	-
104	1713884	5	40	268	495	14	28	12	5	290	40	-	-	8	-	-	24	SURVIVOR	-	Y	-	-	-	-

S No.	MRD	E/A	DCT(ms)	Lateral e' (cm/sec)	Lateral a' (cm/sec)	Septal e' (cm/sec)	SEPTAL a'(cm/sec)	Average e'	Average a'	E/e'	TAPSE (cm/sec)	IVC MAX_{DIA} (cm)	IVC MIN_{DIA} (cm)	IVC COMPRESSIBILTY (%)	IVC DISTENSIBILTY (%)	LV SYSTOLIC DYSFUNCTION	LV DIASTOLIC DYSFUNCTION (Grade)	RIGHT VENTRICULAR DYSFUNCTION
53	1616056	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
54	1630443	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	1632148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	1629231	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57	1632759	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
58	1634282	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
59	1635872	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	743102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	1636450	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	1635866	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	1636384	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	1636413	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	1492614	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
66	1650249	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
67	1649557	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
68	1649778	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
69	1607231	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70	1653960	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
71	1659675	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
72	1662486	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	1662198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
74	1663245	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
75	1664581	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
76	1663407	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
77	1667192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
78	1665679	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
79	1652030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
80	1669718	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
81	1668243	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
82	1671744	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
83	550205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
84	1650755	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
85	1671906	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	1671843	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87	1478561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
88	1244779	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
89	1678148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90	1646402	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
91	1685232	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
92	1690174	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	1679231	0.91	110	-	-	10.2	7.8	-	-	8.69	1.86	1.22	0.86	29.5	41	SEVERE	INDETERMINATE	-
94	1679830	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	1687848	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	1695254	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
97	1651985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
98	1703503	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
99	1705718	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	1703239	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
101	1704572	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	1664841	1.56	220	-	-	12.6	8.4	-	-	7.2	2.1	1.16	0.8	31	45	-	NORMAL	-
103	1664178	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	1713884	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

S No.	MRD	Date	Age (years)	Gender M/F	BMI KG/M^2	SOFA Score PRE SBT	SGA SCORE	CUMULATIVE FLUID BALANCE	NMB DRUG STEROIDS	COMORBIDITIES					SYSTEMIC DISEASES				BASELINE HEMODYNAMICS PRE SBT						
										DM	HTN	COPD	SMOKING	OTHERS	CARDIAC	RENAL	RESPIRATORY	ENDOCRINE	HR	SBP	DBP	MBP	RR	PH	PO2
105	1740368	25-Apr-24	37	M	24.9	2	6	-215	-	-	-	-	-	-	-	-	-	-	77	124	75	87	18	7.28	180
106	1739785	26-Apr-24	26	F	20.4	2	5	461	-	-	-	-	-	-	-	-	-	-	84	128	90	102	18	7.49	182
107	1721147	28-Apr-24	45	F	20.8	4	3	-178	-	-	-	-	-	-	-	-	-	-	84	120	55	79	16	7.57	110
108	1722988	30-Apr-24	29	F	20.4	4	3	20	-	-	-	-	-	-	-	-	-	-	68	105	53	71	14	7.48	150
109	1726081	6-May-24	36	F	24.1	4	5	450	-	-	-	-	-	-	-	-	-	-	87	118	66	84	14	7.38	163
110	1725458	10-May-24	44	M	23.8	2	4	1170	-	-	-	-	-	-	-	-	-	Y	86	134	92	106	15	7.42	162
111	1723752	18-May-24	54	M	24.4	5	4	800	-	Y	Y	-	-	-	-	-	-	-	83	130	86	100	15	7.47	142
112	1734033	20-May-24	24	M	20.4	3	3	200	-	-	-	-	-	-	-	-	-	-	100	137	79	93	14	7.39	102
113	1743678	28-May-24	48	M	19.2	8	6	1080	-	-	-	-	-	-	-	-	-	-	69	134	77	91	14	7.52	139
114	721268	1-Jun-24	44	M	27.3	6	5	3900	-	-	-	-	-	-	-	-	-	-	122	147	86	109	16	7.48	127
115	1747288	8-Jun-24	65	F	19.4	6	3	1440	-	Y	Y	-	-	-	-	Y	-	-	100	137	60	85	18	7.33	191
116	746081	9-Jun-24	48	M	29.8	6	6	150	-	Y	Y	-	-	-	-	Y	-	-	85	145	89	105	24	7.49	87
117	1750144	12-Jun-24	54	M	24.6	2	4	1965	-	Y	-	-	-	-	-	-	-	-	108	169	78	109	13	7.39	179
118	1750252	13-Jun-24	40	M	21.4	3	6	215	-	-	-	-	-	-	-	-	-	-	106	158	106	116	17	7.42	169
119	1745901	14-Jun-24	36	M	29.4	2	6	980	-	-	-	-	-	-	-	-	-	-	103	102	83	91	17	7.5	157
120	1752041	16-Jun-24	65	M	21.6	5	5	-960	-	Y	Y	-	-	-	-	-	-	-	99	126	61	77	22	7.41	112
121	1752041	18-Jun-24	65	M	20.9	2	3	1140	-	-	-	-	-	-	-	-	-	-	96	123	80	89	15	7.47	145
122	1753366	20-Jun-24	20	M	23.8	2	4	1480	-	-	-	-	-	-	-	-	-	-	88	124	78	94	15	7.42	175
123	1754136	21-Jun-24	36	F	22.3	2	5	1760	-	-	-	-	-	-	-	-	-	-	85	127	65	87	18	7.51	78
124	1757298	23-Jun-24	75	F	20.4	3	4	850	-	-	-	-	-	-	-	-	-	-	98	160	70	100	18	7.43	113
125	1757704	24-Jun-24	23	F	23.8	5	4	840	-	-	-	-	-	-	-	-	-	-	80	153	98	121	14	7.33	137
126	1757173	25-Jun-24	44	F	22.8	5	5	1672	-	-	-	-	-	-	-	-	-	-	82	104	69	85	18	7.36	173
127	1759571	27-Jun-24	39	M	26.7	2	6	1028	-	-	-	-	-	-	-	-	-	-	117	148	77	98	17	7.48	149
128	1759578	28-Jun-24	47	M	25.5	3	5	1300	-	-	-	-	-	-	-	-	-	-	83	110	76	99	18	7.37	85
129	1759571	28-Jun-24	39	M	26.7	2	5	1028	-	-	-	-	-	-	-	-	-	-	116	148	77	98	17	7.48	148
130	1763228	3-Jul-24	39	F	20.5	2	4	455	-	-	-	-	-	-	-	-	-	-	98	121	61	82	19	7.34	198
131	1758799	4-Jul-24	24	M	22.4	2	5	-206	-	-	-	-	-	-	-	-	-	-	109	122	74	90	18	7.51	93
132	1758605	6-Jul-24	48	M	21.7	4	4	-120	-	Y	Y	-	-	-	-	-	-	-	98	120	60	88	19	7.44	190
133	1697864	8-Jul-24	57	F	20.1	5	4	1230	-	Y	Y	-	-	-	-	Y	-	-	98	125	62	78	16	7.41	214
134	1767564	9-Jul-24	58	F	27.6	8	6	1060	-	Y	-	-	-	-	-	Y	-	-	96	118	64	78	18	7.38	88
135	1769968	12-Jul-24	27	M	21.8	3	5	420	-	-	-	-	-	-	-	-	-	-	86	147	85	105	19	7.47	241
136	1770704	14-Jul-24	65	M	26.8	5	6	1440	-	-	Y	Y	Y	-	-	-	-	-	111	116	64	73	18	7.38	212
137	1770711	15-Jul-24	35	M	26.7	2	6	1323	-	-	-	-	-	-	-	-	-	-	99	153	75	101	18	7.4	194
138	1770013	16-Jul-24	72	F	21.2	2	4	1000	-	-	-	-	-	-	-	-	-	-	83	129	71	92	19	7.42	97
139	1771301	17-Jul-24	20	M	21.4	2	4	680	-	-	-	-	-	-	-	-	-	-	106	121	75	92	14	7.37	251
140	1758262	18-Jul-24	40	F	25.8	2	6	750	-	-	Y	-	-	-	-	-	-	-	88	101	61	63	12	7.5	166
141	1779505	30-Jul-24	42	M	20.9	2	5	3035	-	-	-	-	-	-	-	-	-	-	65	113	91	78	15	7.48	206
142	1706663	1-Aug-24	53	F	23.5	6	6	455	-	-	-	-	-	-	-	-	-	-	126	133	76	96	15	7.42	191
143	1782858	3-Aug-24	22	M	24.7	3	4	2575	-	-	-	-	-	-	-	-	-	-	66	102	59	64	16	7.42	186
144	1784393	6-Aug-24	26	M	24.9	3	4	661	-	-	-	-	-	-	-	-	-	-	102	128	76	93	18	7.44	208
145	1786272	7-Aug-24	52	M	31.6	2	6	478	-	Y	Y	-	-	-	-	-	-	-	110	110	64	80	16	7.36	143
146	1785724	7-Aug-24	52	M	24.2	4	5	450	-	-	Y	-	-	-	-	-	-	-	102	156	82	108	18	7.36	140
147	1789166	12-Aug-24	65	F	24.7	3	5	875	-	Y	Y	-	-	-	-	-	-	-	100	106	63	80	19	7.37	167
148	1789167	13-Aug-24	50	M	26.4	4	4	1378	-	-	Y	-	-	-	-	Y	-	-	87	146	59	84	16	7.35	138
149	1788342	14-Aug-24	70	M	23.1	2	4	1090	-	Y	Y	Y	-	-	-	-	-	-	83	153	65	95	15	7.5	189
150	1800137	29-Aug-23	40	M	27.2	3	6	850	-	-	-	-	-	-	-	-	-	-	90	144	77	98	17	7.44	135

S No.	MRD	BASELINE ABG PRE SBT				REASON FOR MECHANCIAL VENTILATION(MV)					DURATION OF MV								
						POST	NEURO	ALI/ or	SEPSIS	OTHER									
		PCO2	HCO3	LACTATE	GLUCOSE	SURGICAL	TRAUMA	LUNG INFECTION			PRE SBT	LVEF	E (cm/sec)	A (cm/sec)	E/A	DCT(ms)	Lateral e'(cm/sec)	Lateral a'(cm/sec)	Septal e'(cm/sec)
105	1740368	35	19.1	2.5	275	Y	-	-	-	-	1	GOOD	69.6	45.2	1.53	190	-	-	16.1
106	1739785	30	23.9	1	143	Y	-	-	-	-	1	GOOD	98.8	104.6	0.94	210	-	-	12.6
107	1721147	32	29.3	1.3	100	Y	-	-	-	-	2	GOOD	88.3	85.4	1.03	260	-	-	16.7
108	1722988	35	26.1	1.1	105	Y	-	-	-	-	1	GOOD	88.3	75.4	1.17	260	-	-	14.2
109	1726081	31	21	0.9	120	Y	-	-	-	-	4	GOOD	110	94.6	1.16	220	-	-	12.8
110	1725458	28	19.8	1.2	178	Y	-	-	-	-	2	GOOD	96.4	91.6	1.05	240	-	-	15.9
111	1723752	36	22.6	0.8	106	Y	-	-	-	-	2	MILD	95	68	1.39	180	-	-	12.9
112	1734033	39	22.4	1.1	164	-	Y	-	-	-	6	GOOD	108.4	69.6	1.5	220	-	-	10.38
113	1743678	38	31	1.3	117	Y	-	-	-	-	3	GOOD	99.1	86.1	1.15	200	-	-	12.5
114	721268	42	30.5	1	188	Y	-	-	-	-	3	GOOD	112	61.7	1.81	190	-	-	23
115	1747288	27	16.8	1.5	146	Y	-	-	-	-	3	GOOD	91.9	106.2	0.86	220	-	-	10
116	746081	37	28.7	1.4	146	-	Y	-	-	-	4	GOOD	94.2	97.4	0.96	220	-	-	6.25
117	1750144	32	21.2	0.9	177	Y	-	-	-	-	2	GOOD	81.1	73.9	1.09	160	-	-	10.7
118	1750252	38	25.2	1	133	Y	-	-	-	-	2	GOOD	70.3	79.7	0.88	180	-	-	16.3
119	1745901	33	27.1	3	136	Y	-	-	-	-	10	SEVERE	51	47	1.08	210	-	-	8.2
120	1752041	33	22.9	1.8	128	Y	-	-	-	-	2	MODERATE	72.7	50.6	1.4	170	-	-	10.6
121	1752041	31	23.6	0.8	198	Y	-	-	-	-	3	MODERATE	57.4	79	0.72	180	-	-	8.97
122	1753366	37	27.6	1.3	122	-	Y	-	-	-	5	GOOD	97.6	72.5	1.34	240	-	-	11.8
123	1754136	33	27.9	1.7	152	Y	Y	-	-	-	5	GOOD	103.4	101.2	1.02	180	-	-	11.6
124	1757298	32	23	1	207	Y	-	-	-	-	1	MILD	76.1	109.8	0.69	210	7.68	8.98	5.08
125	1757704	34	19.3	1.4	110	Y	-	-	-	-	1	GOOD	93.3	79.7	1.17	220	-	-	11.5
126	1757173	40	23	2.6	127	Y	-	-	-	-	3	GOOD	94	69.6	1.35	270	-	-	15.6
127	1759571	38	28.6	1.3	110	Y	-	-	-	-	2	GOOD	81.1	97.6	0.83	250	-	-	12.1
128	1759578	40	24.1	3.2	124	Y	-	-	-	-	1	GOOD	121.3	76.8	1.57	240	-	-	16.3
129	1759571	38	28.5	1.3	110	Y	-	-	-	-	1	GOOD	81.1	97.6	0.83	250	-	-	12.1
130	1763228	37	20.9	1.5	202	Y	-	-	Y	-	2	GOOD	81.1	60.3	1.34	240	-	-	12.6
131	1758799	36	29.1	1	106	Y	-	-	-	-	9	MODERATE	71.1	63.9	1.11	230	-	-	14.7
132	1758605	37	21.8	1.5	102	Y	-	-	-	-	1	MODERATE	84	112	0.75	170	-	-	14
133	1697864	35	21.8	1.2	170	Y	-	-	-	-	3	GOOD	78.4	59.6	1.3	230	-	-	15.8
134	1767564	38	21.6	1.8	110	Y	-	-	-	-	3	SEVERE	92.7	76.9	1.2	110	-	-	12.2
135	1769968	44	32	0.9	125	Y	-	-	-	-	1	GOOD	82.6	82	1	220	-	-	17.4
136	1770704	34	20.2	1.6	99	Y	-	-	-	-	1	SEVERE	54	50	1.08	200	-	-	10.8
137	1770711	36	23.3	0.9	131	Y	-	-	-	-	4	GOOD	118.4	57.4	2.06	250	-	-	19.1
138	1770013	38	30.7	0.7	200	-	Y	-	-	-	4	GOOD	91.9	94.8	0.96	280	-	-	12.8
139	1771301	37	22.3	1.1	135	Y	-	-	-	-	2	GOOD	94.9	91.8	1.03	280	-	-	12.8
140	1758262	31	24.2	3.5	149	Y	Y	-	-	-	1	GOOD	74.7	61.7	1.21	250	-	-	10.5
141	1779505	42	31.3	0.6	85	-	-	-	-	SNAKEBITE	4	GOOD	61.7	70.3	1.26	220	-	-	13.5
142	1706663	26	16.9	2.8	110	Y	-	-	-	-	2	MILD	71.1	45.9	1.54	160	-	-	6.51
143	1782858	44	28.5	3.7	119	Y	-	-	-	-	2	GOOD	86.1	36.6	2.35	200	-	-	20.7
144	1784393	42	30.6	2.4	92	Y	-	-	-	-	2	GOOD	73.9	48.8	1.51	220	-	-	27.2
145	1786272	34	22.4	1.6	104	Y	Y	-	-	-	2	GOOD	84.7	92.6	0.91	200	-	-	14.2
146	1785724	36	26	1.2	168	-	Y	-	-	-	1	GOOD	91.2	62.5	1.45	190	-	-	15.4
147	1789166	34	18.7	2.2	131	Y	-	-	-	-	1	SEVERE	94.8	52.5	1.8	130	-	-	7.94
148	1789167	33	20.2	2.2	151	Y	-	-	-	-	2	MILD	75.2	92.8	0.81	290	-	-	12.2
149	1788342	35	27.5	0.7	138	Y	-	-	-	-	2	GOOD	92.6	121.3	0.76	290	-	-	8.85
150	1800137	41	27.8	0.8	102	Y	-	-	-	-	2	GOOD	109	62.5	1.74	200	-	-	14.2

S No.	MRD	PRE SBT											
		SEPTAL a'(cm/sec)	Average e'	Average a'	E/e'	TAPSE(cm/sec)	IVC MAX_{DIA} (cm)	IVC MIN_{DIA} (cm)	IVC COMPRESSIBILTY (%)	IVC DISTENSIBILTY (%)	DIURETICS USE	LV SYSTOLIC DYSFUNCTION
105	1740368	6.73	-	-	4.32	1.83	1.74	1.3	25	33	-	-
106	1739785	6.8	-	-	7.84	2.1	1.08	0.66	38	63	-	-
107	1721147	10.4	-	-	5.28	1.83	1.2	0.82	31.7	46	-	-
108	1722988	5.34	-	-	6.21	2.02	1.64	1.01	38.4	62	-	-
109	1726081	7.9	-	-	8.59	2.1	1.31	0.77	41	70	-	-
110	1725458	8.55	6.06	-	6.06	1.94	1.18	0.72	38	63	-	-
111	1723752	8.8	-	-	7.76	1.89	1.16	0.67	42	73	-	MILD
112	1734033	6.25	-	-	10.44	3.02	1.51	1.07	29.1	41	-	-
113	1743678	8.85	-	-	7.92	2.02	1.83	1.58	13.7	15	-	-
114	721268	12.2	-	-	4.86	2.14	1.51	1.13	25.2	33	-	-
115	1747288	10.4	-	-	9.19	1.83	1.58	1.07	32.3	47	-	-
116	746081	5.47	-	-	15	2.72	1.87	1.27	32.1	47	Y	-
117	1750144	6.77	-	-	7.57	1.95	1.78	1.18	33.7	52	-	-
118	1750252	9.11	-	-	4.31	1.76	1	0.5	50	100	-	-
119	1745901	8.07	-	-	6.21	2.02	1.55	0.96	38.1	61	-	SEVERE
120	1752041	11.8	-	-	6.8	1.9	1.4	0.79	43	77	-	MODERATE
121	1752041	12.9	-	-	6.39	1.89	1.26	0.57	54.8	121	-	MODERATE
122	1753366	8.59	-	-	8.27	2.08	1.2	0.88	26.7	36	-	-
123	1754136	8.98	-	-	8.91	2.21	1.76	1.07	39.2	64	Y	-
124	1757298	8.72	6.38	8.85	11.9	1.71	1.26	0.63	50	100	Y	MILD
125	1757704	12.5	-	-	8.11	1. 95	1.2	0.63	47.5	90	-	-
126	1757173	7.68	-	-	6.02	2.77	1.51	1.05	33	43	-	-
127	1759571	5.21	-	-	6.7	1.95	1.26	0.84	33	50	-	-
128	1759578	6.25	-	-	7.44	2.96	2.14	1.58	26.2	35	Y	-
129	1759571	5.21	-	-	6.7	1.95	1.26	0.84	33	50	-	-
130	1763228	8.2	-	-	6.43	1.89	1.39	0.88	36.7	57	-	-
131	1758799	5.34	-	-	4.83	1.83	1.26	0.82	34.9	53	-	MODERATE
132	1758605	7.2	-	-	6	2.1	1.27	0.87	31	45	Y	MODERATE
133	1697864	7.1	-	-	4.96	2	1.18	0.8	32	47	-	-
134	1767564	6.9	-	-	7.5	1.8	1.8	1.5	16	20	Y	SEVERE
135	1769968	9.25	-	-	4.74	2.14	1.67	0.93	44	79	-	-
136	1770704	5.64	-	-	5	1.98	1.12	0.76	32	47	-	SEVERE
137	1770711	6.9	-	-	6.19	2	2.07	1.63	21.3	26	Y	-
138	1770013	7.55	-	-	7.17	2.23	1.64	1.01	38.4	62	-	-
139	1771301	7.55	-	-	7.41	1.78	1.64	1	38.4	62	Y	-
140	1758262	7.81	-	-	7.11	1.72	1.3	0.99	23.8	31	Y	-
141	1779505	7.29	-	-	4.57	1.83	1.58	1.07	32.3	47	-	-
142	1706663	8.46	-	-	10.92	1.89	1.51	1.2	20.5	25	-	MILD
143	1782858	6.77	-	-	4.15	1.93	2.3	1.78	22.6	29	Y	-
144	1784393	8.07	-	-	2.71	2.15	1.48	0.96	35.1	54	-	-
145	1786272	10.3	-	-	5.96	2.08	1.78	1.11	37.6	60	-	-
146	1785724	4.82	-	-	5.9	2.21	2.21	1.58	28.5	39	Y	-
147	1789166	6.38	-	-	11.9	1.51	2.08	1.89	9.13	10	Y	SEVERE
148	1789167	8.59	-	-	6.16	1.76	2.15	1.7	20.9	26	Y	MILD
149	1788342	8.3	-	-	10.46	2.15	1.48	0.81	45.3	82	-	-
150	1800137	9.11	-	-	7.67	2.21	1.45	0.88	39.3	64	-	-

S No.	MRD	ECHO ASSESSMENT											
		LV DIASTOLIC DYSFUNCTION (Grade)	RIGHT VENTRICULAR DYSFUNCTION	LVEF	E (cm/sec)	A (cm/sec)	E/A	DCT(ms)	Lateral e'(cm/sec)	Lateral a'(cm/sec)	SEPTAL e'(cm/sec)	SEPTAL a'(cm/sec)	Average e'
105	1740368	NORMAL	-	GOOD	70.3	42.4	1.65	250	-	-	14.1	6.64	-
106	1739785	NORMAL	-	GOOD	106.2	115.6	0.91	240	-	-	16.4	11.3	-
107	1721147	NORMAL	-	GOOD	66.8	79.7	0.83	300	-	-	13.2	8.67	-
108	1722988	NORMAL	-	GOOD	89.7	73.9	1.21	230	-	-	16	7.03	-
109	1726081	INDETERMINATE	-	GOOD	110.6	84.8	1.3	170	-	-	14.1	10.4	-
110	1725458	NORMAL	-	GOOD	100.3	86.7	1.15	270	-	-	13	6.59	-
111	1723752	NORMAL	-	MILD	93	63	1.47	150	-	-	12.4	10.6	-
112	1734033	INDETERMINATE	-	GOOD	111.3	91.2	1.22	210	-	-	16.3	7.03	-
113	1743678	NORMAL	-	GOOD	97.9	87.8	1.11	200	-	-	9.38	13.4	-
114	721268	NORMAL	-	GOOD	117	67.5	1.73	170	-	-	18.1	10.5	-
115	1747288	INDETERMINATE	-	GOOD	93.3	113.4	0.82	120	-	-	8.85	10.7	-
116	746081	PSUEDONORMAL	-	GOOD	96.4	106.2	0.9	120	-	-	7.8	8.9	-
117	1750144	NORMAL	-	GOOD	71.1	71.8	0.99	210	-	-	15.1	8.85	-
118	1750252	NORMAL	-	MILD	77.5	82.6	0.93	240	-	-	16.1	9.16	-
119	1745901	NORMAL	-	SEVERE	59.6	45.9	1.29	210	-	-	9.8	6.84	-
120	1752041	NORMAL	-	SEVERE	58.4	56.2	1.03	170	-	-	6.4	8.6	-
121	1752041	INDETERMINATE	-	SEVERE	60.3	42.6	0.65	220	-	-	6.3	8.7	-
122	1753366	INDETERMINATE	-	GOOD	88.3	67.5	1.3	310	-	-	11.8	9.51	-
123	1754136	INDETERMINATE	-	GOOD	104.9	84.8	1.23	180	-	-	10.4	8.72	-
124	1757298	INDETERMINATE	-	SEVERE	69.7	89.1	0.78	150	5.78	10	4.43	10.9	5.08
125	1757704	INDETERMINATE	-	GOOD	84	82.8	1.01	270	-	-	12.8	9.11	-
126	1757173	NORMAL	-	GOOD	122	85.4	1.42	260	-	-	17.3	8.2	-
127	1759571	NORMAL	-	GOOD	94	112	0.83	190	-	-	12.8	5.34	-
128	1759578	NORMAL	-	GOOD	114.9	72.5	1.58	230	-	-	13.4	4.69	-
129	1759571	NORMAL	-	GOOD	94	112	0.83	190	-	-	12.8	5.34	-
130	1763228	NORMAL	-	GOOD	84.7	66	1.28	220	-	-	15.1	7.55	-
131	1758799	NORMAL	-	MODERATE	89.3	72.5	1.23	190	-	-	16	7.16	-
132	1758605	NORMAL	-	MODERATE	105.8	106.9	0.98	170	-	-	14.8	5.34	-
133	1697864	NORMAL	-	GOOD	91.2	66.9	1.36	210	-	-	17.6	9.3	-
134	1767564	NORMAL	-	SEVERE	109.9	91	1.2	170	-	-	14.8	7.42	-
135	1769968	NORMAL	-	GOOD	84.7	49.5	1.7	240	-	-	14.6	5.34	-
136	1770704	NORMAL	-	SEVERE	69.6	55.7	1.24	210	-	-	9.6	6.8	-
137	1770711	NORMAL	-	GOOD	99.8	66	1.51	210	-	-	19	7.42	-
138	1770013	NORMAL	-	GOOD	104.4	92.6	1.12	220	-	-	16.4	10.6	-
139	1771301	NORMAL	-	GOOD	109.1	180.4	0.6	150	-	-	19.4	6.64	-
140	1758262	NORMAL	-	GOOD	84	76.1	1.1	240	-	-	9.7	7.16	-
141	1779505	NORMAL	-	GOOD	70.3	41.6	1.68	270	-	-	12.1	8.07	-
142	1706663	PSUEDONORMAL	-	MILD	76.8	38	2.02	170	-	-	10	10.8	-
143	1782858	NORMAL	-	GOOD	107.1	56.7	1.88	220	-	-	19.9	7.16	-
144	1784393	NORMAL	-	GOOD	71.8	76.8	0.93	150	-	-	27	7.94	-
145	1786272	NORMAL	-	GOOD	114.9	104.8	1.1	260	-	-	15.4	8.07	-
146	1785724	NORMAL	-	GOOD	106.2	70.3	1.51	210	-	-	15.8	6.38	-
147	1789166	PSUEDONORMAL	Y	SEVERE	84	40.9	2.05	110	-	-	9.38	7.42	-
148	1789167	NORMAL	-	MILD	76.1	94	0.8	260	-	-	10.9	9.25	-
149	1788342	INDETERMINATE	-	GOOD	79	104.8	0.75	270	-	-	8.85	6.64	-
150	1800137	NORMAL	-	GOOD	104.1	67.5	1.54	170	-	-	14.8	8.6	-

S No.	MRD	POST SBT										V		
		Average a'	E/e'	TAPSE(cm/sec)	IVC MAX $_{DIA}$ (cm)	IVC MIN $_{DIA}$ (cm)	IVC COMPRESSIBILTY (%)	IVC DISTENSIBILTY (%)	LV SYSTOLIC DYSFUNCTION	LV DIASTOLIC DYSFUNCTION	RV SYSTOLIC DYSFUNCTION	TV	RR	RSBI
105	1740368	-	4.98	2.02	1.37	0.94	31	45	-	NORMAL	-	434	22	51
106	1739785	-	6.47	2.27	1.2	0.5	58.3	140	-	NORMAL	-	450	16	36
107	1721147	-	5.06	2.08	1.64	1.01	38.4	62	-	NORMAL	-	525	16	30
108	1722988	-	5.6	2.08	1.07	0.69	35	55	-	NORMAL	-	401	14	35
109	1726081	-	7.9	2.2	1.46	0.93	36	56	-	NORMAL	-	450	16	36
110	1725458	-	7.71	1.8	1.26	0.74	43	70	-	NORMAL	-	450	14	32
111	1723752	-	7.5	1.9	1.23	0.69	43	78	MILD	NORMAL	-	474	20	42
112	1734033	-	6.8	2.43	1.26	1.07	15.1	17	-	NORMAL	-	523	14	28
113	1743678	-	10.4	2.02	1.58	0.88	44.3	79	-	INDETERMINATE	-	512	17	33
114	721268	-	6.46	2.81	1.7	1.5	8.82	13	-	NORMAL	-	400	17	43
115	1747288	-	10.54	1.64	1.26	0.63	50	100	-	INDETERMINATE	Y	400	14	35
116	746081	-	12.35	2.14	1.62	1.12	30	44	-	PSUEDONORMAL	-	523	25	47
117	1750144	-	4.7	2.08	1.58	1.2	24.1	31	-	NORMAL	-	557	15	26
118	1750252	-	4.81	2.9	1.2	0.57	52	110	MILD	NORMAL	-	566	17	30
119	1745901	-	6.08	1.64	1.51	1.2	20.5	25	SEVERE	NORMAL	Y	456	17	38
120	1752041	-	9.125	1.76	1.46	0.68	53	114	SEVERE	INDETERMINATE	-	450	16	36
121	1752041	-	9.57	1.7	1.2	0.69	42.5	73	SEVERE	INDETERMINATE	-	450	15	34
122	1753366	-	7.48	2.39	1.39	0.76	45.3	82	-	NORMAL	-	450	14	32
123	1754136	-	10.08	2.21	1.26	0.69	45.2	82	-	INDETERMINATE	-	450	16	36
124	1757298	10.45	13.7	1.83	1.32	0.63	52.3	109	SEVERE	INDETERMINATE	-	400	18	45
125	1757704	-	6.56	2.08	1.2	0.57	52.5	110	-	NORMAL	-	474	18	38
126	1757173	-	7.05	2.96	1.45	1.02	30.3	42	-	NORMAL	-	408	18	44
127	1759571	-	7.34	2.27	1.42	0.96	32	48	-	NORMAL	-	477	17	36
128	1759578	-	8.55	2.7	1.83	1.2	34.4	52.5	-	INDETERMINATE	-	470	18	39
129	1759571	-	7.34	2.27	1.42	0.96	32	48	-	NORMAL	-	477	17	36
130	1763228	-	5.6	2.14	1.32	0.69	47.7	91	-	NORMAL	-	473	16	34
131	1758799	-	5.58	2.08	1	0.5	50	100	MODERATE	NORMAL	-	508	20	40
132	1758605	-	7.14	1.9	1	0.67	33	49	MODERATE	NORMAL	-	450	16	36
133	1697864	-	5.18	1.96	1.48	1.12	24	32	-	NORMAL	-	450	18	40
134	1767564	-	7.42	2	1.67	1.23	44	35	SEVERE	NORMAL	-	450	19	42
135	1769968	-	5.8	2.18	2.02	1.32	34.7	53	-	NORMAL	-	450	16	36
136	1770704	-	7.25	2.1	1.34	0.88	34	52	SEVERE	NORMAL	-	521	19	36
137	1770711	-	5.25	2.12	1.55	1.04	32.9	49	-	NORMAL	-	472	18	38
138	1770013	-	6.36	2.3	1.82	1.26	30.7	44	-	NORMAL	-	461	14	30
139	1771301	-	5.62	1.9	1.7	1.13	33.5	50	-	INDETERMINATE	-	486	14	29
140	1758262	-	8.65	2.1	1.66	1.4	15.7	18	-	INDETERMINATE	-	450	16	36
141	1779505	-	5.8	1.89	1.45	1.01	30.3	43	-	NORMAL	-	441	15	34
142	1706663	-	7.68	1.7	1.58	1.13	28.5	39	MILD	NORMAL	-	412	16	39
143	1782858	-	5.38	2.33	1.64	1.01	38.4	62	-	NORMAL	-	473	16	34
144	1784393	-	2.65	2.22	1.85	1.11	40	66	-	NORMAL	-	455	17	38
145	1786272	-	7.46	2.27	1.7	1.26	25.9	34	-	NORMAL	-	500	16	32
146	1785724	-	6.72	2.27	2.33	1.64	29.6	42	-	NORMAL	-	614	15	25
147	1789166	-	8.95	1.95	1.64	1.07	34.8	53	SEVERE	INDETERMINATE	-	440	16	32
148	1789167	-	6.98	1.76	1.76	0.88	50	100	MILD	NORMAL	-	481	16	34
149	1788342	-	8.92	2	1.63	1.18	27.6	38	-	INDETERMINATE	-	456	14	30
150	1800137	-	7.03	2.02	1.51	0.44	70.9	243	-	NORMAL	-	441	19	43

S No.	MRD	VENTILATOR PARAMETERS/WEANING PARAMETERS										SBT	REASON	DURATION OF VENTILATOR DAYS	NIV USED	REINTUBATION	DURATION OF ICU DAYS	28 DAY OUTCOME		INCLUDED	EXCLUDED	LVEF	E (cm/sec)	A (cm/sec)
		PRE SBT			POST SBT																			
		PEEP	FiO2	PaO_2/FIO_2	TV	RR	RSBI	PS	PEEP	PaO_2/FIO_2	FIO_2	FAILURE						SURVIVOR	NONSURVIVOR					
105	1740368	5	40	450	423	17	40	0	5	380	30	-	-	5	-	-	18	SURVIVOR	-	Y	-	-	-	-
106	1739785	5	40	455	423	22	52	0	5	390	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
107	1721147	6	40	220	500	21	51	15	5	234	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
108	1722988	5	40	300	408	13	26	10	5	260	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
109	1726081	5	40	336	460	16	35	0	5	340	40	-	-	4	-	-	12	SURVIVOR	-	Y	-	-	-	-
110	1725458	5	40	334	394	16	40	0	5	348	40	-	-	3	-	-	7	SURVIVOR	-	Y	-	-	-	-
111	1723752	5	40	284	450	15	34	0	5	286	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
112	1734033	5	40	255	492	17	35	8	5	270	40	-	-	6	-	-	16	SURVIVOR	-	Y	-	-	-	-
113	1743678	5	40	278	402	22	54	0	5	268	40	-	-	6	-	-	64	SURVIVOR	-	Y	-	-	-	-
114	721268	5	40	318	452	15	35	6	5	320	40	-	-	3	-	-	10	SURVIVOR	-	Y	-	-	-	-
115	1747288	5	40	382	332	16	47	15	5	366	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
116	746081	5	40	174	480	28	58	0	5	176	40	-	-	4	Y	-	12	SURVIVOR	-	Y	-	-	-	-
117	1750144	5	40	358	563	13	23	0	5	324	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
118	1750252	5	40	338	520	16	32	0	5	398	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
119	1745901	5	40	392	408	25	53	15	5	380	40	-	-	10	Y	-	18	SURVIVOR	-	Y	-	-	-	-
120	1752041	5	40	224	360	33	91	10	5	240	40	Y	SEVERE LV DYSFU	12	-	-	12	-	NONSURVIVOR	Y	-	-	-	-
121	1752041	5	40	290	474	18	38	6	5	278	40	-	-	3	-	-	12	SURVIVOR	-	Y	-	-	-	-
122	1753366	5	40	350	344	19	57	0	5	344	40	-	-	6	-	-	25	SURVIVOR	-	Y	-	-	-	-
123	1754136	5	40	156	465	18	46	0	5	168	40	-	-	6	-	-	11	SURVIVOR	-	Y	-	-	-	-
124	1757298	5	40	226	276	26	116	0	5	216	40	Y	SEVERE LV DYSFU	5	Y	-	12	SURVIVOR	-	Y	-	SEVERE	69.7	89.1
125	1757704	5	40	274	498	15	28	0	5	272	40	-	-	2	-	-	6	SURVIVOR	-	Y	-	-	-	-
126	1757173	5	40	246	466	15	32	15	5	230	40	-	-	3	-	-	10	SURVIVOR	-	Y	-	-	-	-
127	1759571	5	40	298	538	20	44	0	5	270	40	-	-	2	-	-	18	SURVIVOR	-	Y	-	-	-	-
128	1759578	5	40	170	509	15	30	0	5	170	40	-	-	1	-	-	5	SURVIVOR	-	Y	-	-	-	-
129	1759571	5	40	298	538	20	44	0	5	268	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
130	1763228	5	40	396	402	12	28	0	5	360	40	-	-	2	-	-	10	SURVIVOR	-	Y	-	-	-	-
131	1758799	5	40	185	623	25	40	12	5	210	40	Y	MODEREATE LV D	15	-	-	26	SURVIVOR	-	Y	-	MODERATE	89.3	72.5
132	1758605	5	40	380	420	18	42	0	5	364	40	-	-	1	-	-	7	SURVIVOR	-	Y	-	-	-	-
133	1697864	5	40	428	432	20	46	0	5	404	40	-	-	4	-	-	12	SURVIVOR	-	Y	-	-	-	-
134	1767564	5	40	176	344	22	60	12	5	168	40	Y	SEVERE LV DYSFU	14	-	-	14	-	NONSURVIVOR	Y	-	-	-	-
135	1769968	5	40	422	512	18	36	0	5	400	40	-	-	4	-	-	7	SURVIVOR	-	Y	-	-	-	-
136	1770704	5	40	424	743	13	20	0	5	446	40	-	-	3	-	-	10	-	NONSURVIVOR	Y	-	-	-	-
137	1770711	5	40	285	511	19	36	8	5	316	40	-	-	6	-	-	15	SURVIVOR	-	Y	-	-	-	-
138	1770013	5	40	242	470	20	43	6	5	230	40	-	-	8	-	-	18	SURVIVOR	-	Y	-	-	-	-
139	1771301	5	40	502	536	23	65	0	5	460	40	-	-	2	-	-	10	SURVIVOR	-	Y	-	-	-	-
140	1758262	5	40	415	460	12	26	0	5	390	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
141	1779505	5	40	515	446	16	36	6	5	540	40	-	-	5	-	-	8	SURVIVOR	-	Y	-	-	-	-
142	1706663	5	40	478	349	24	76	0	5	490	40	-	-	3	-	-	12	SURVIVOR	-	Y	-	-	-	-
143	1782858	5	40	372	1030	9	9	0	5	340	40	-	-	3	-	-	10	SURVIVOR	-	Y	-	-	-	-
144	1784393	5	40	416	386	25	74	0	5	380	40	-	-	3	-	-	10	SURVIVOR	-	Y	-	-	-	-
145	1786272	5	40	286	876	16	18	6	5	314	40	-	-	2	Y	-	8	SURVIVOR	-	Y	-	-	-	-
146	1785724	5	40	280	765	15	27	6	5	276	40	-	-	4	-	-	12	SURVIVOR	-	-	-	-	-	-
147	1789166	5	40	417	394	18	46	10	5	420	40	-	-	2	-	-	8	SURVIVOR	-	Y	-	-	-	-
148	1789167	5	40	276	433	12	29	6	5	260	40	-	-	3	-	-	8	SURVIVOR	-	Y	-	-	-	-
149	1788342	5	40	378	524	13	24	10	5	340	40	-	-	4	-	-	6	-	NONSURVIVOR	Y	-	-	-	-
150	1800137	5	50	270	494	15	30	0	5	260	50	-	-	2	-	-	6	SURVIVOR	-	Y	-	-	-	-

S No.	MRD	E/A	DCT(ms)	Lateral e' (cm/sec)	Lateral a' (cm/sec)	Septal e' (cm/sec)	SEPTAL a'(cm/sec)	Average e'	Average a'	E/e'	TAPSE (cm/sec)	IVC MAX_{DIA} (cm)	IVC MIN_{DIA} (cm)	IVC COMPRESSIBILTY (%)	IVC DISTENSIBILTY (%)	LV SYSTOLIC DYSFUNCTION	LV DIASTOLIC DYSFUNCTION (Grade)	RIGHT VENTRICULAR DYSFUNCTION
105	1740368	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106	1739785	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	1721147	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
108	1722988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
109	1726081	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
110	1725458	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
111	1723752	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
112	1734033	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
113	1743678	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
114	721268	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
115	1747288	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
116	746081	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
117	1750144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
118	1750252	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
119	1745901	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
120	1752041	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
121	1752041	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
122	1753366	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
123	1754136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
124	1757298	0.78	150	5.78	10	4.43	10.9	5.08	10.45	13.7	1.83	1.32	0.63	52.3	109	SEVERE	INDETERMINATE	-
125	1757704	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
126	1757173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
127	1759571	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
128	1759578	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
129	1759571	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
130	1763228	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
131	1758799	1.23	190	-	-	16	7.16	-	-	5.58	2.08	1	0.5	50	100	MODERATE	NORMAL	-
132	1758605	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
133	1697864	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
134	1767564	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
135	1769968	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
136	1770704	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
137	1770711	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
138	1770013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
139	1771301	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
140	1758262	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
141	1779505	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
142	1706663	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
143	1782858	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
144	1784393	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
145	1786272	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
146	1785724	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
147	1789166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
148	1789167	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
149	1788342	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
150	1800137	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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The Principal
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Ludhiana

Subject:: Approval of Plan of Thesis.

This is to inform you that the Faculty of Medical Sciences in its meeting held on 25.09.2023 has approved the plan of thesis of **Vaibhav Taneja**, a student of your college for **DM Critical Care Medicine** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
Evaluation of cardiovascular function in weaning failure .

Supervisor	**Co-Supervisor:-**	**Co-Supervisor:-**
Dr. Parshotam Lal Gautam Prof. & Head, Dept. of Critical Care Medicine	Dr. Gunchan Paul Assoc. Prof., Dept. of Critical Care Medicine	Dr. Shruti Sharma Asst. Professor Dept. of Critical Care Medicine

The student may submit the thesis in triplicate alongwith the plan in triplicate also, to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She may be directed to attach a photocopy of this letter with the forwarding letter while submitting thesis in the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic, if any.

Controller of Examinations

Note :

1. *If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.*

EVALUATION OF CARDIOVASCULAR FUNCTION IN WEANING FAILURE

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

DM

In

CRITICAL CARE MEDICINE

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

OCTOBER, 2022

DR. VAIBHAV TANEJA

DEPARTMENT OF CRITICAL CARE MEDICINE
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	EVALUATION OF CARDIOVASCULAR FUNCTION IN WEANING FAILURE
For the degree of	D.M. Critical Care Medicine
Name of the candidate	Dr. Vaibhav Taneja
Supervisor	Dr. Parshotam Lal Gautam, Professor & Head, Department of Critical Care Medicine, DMCH, Ludhiana
Co-supervisor(s)	Dr. Gunchan Paul, Associate Professor Department of Critical Care Medicine, DMCH, Ludhiana Dr. Shruti Sharma, Assistant Professor Department of Critical Care Medicine, DMCH, Ludhiana
Institution	Dayanand Medical College and Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: Any alteration in the functioning of the heart with limited cardiovascular reserve compounds the weaning process and prolongs the ventilatory requirement. The mechanical markers of weaning are poor in predicting weaning success as they donot take into account the functional physiology of the cardiovascular system. Transthoracic echocardiography provides comprehensive information on morphology and the dynamics of cardiac function. This information can be utilised by the critical care team into a clinical management plan to guide therapeutic decision making during the weaning process. Therefore, we try to evaluate the transthoracic echocardiographic parameters associated with weaning failure during the process of weaning.

Aim of Study: Evaluation of incidence of left and right ventricular dysfunction in patients with weaning failure from ventilator during the weaning process.

Materials & Methods: A prospective, observational study will be conducted on 150 patients on mechanical ventilation started on weaning process in the Intensive care units of Dayanand Medical College and Hospital Ludhiana.

Clinical Significance: This study will help us to identify left ventricular and right ventricular dysfunction as a cause of weaning failure during the process of weaning.

Keywords: Weaning Failure, Transthoracic Echocardiography, Right Ventricular Dysfunction, Left Ventricular Dysfunction

(Signature)	(Signature)	(Signature)	(Signature)	(Signature)
Candidate	Co-supervisor	Co-supervisor	Supervisor	Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"EVALUATION OF CARDIOVASCULAR FUNCTION IN WEANING FAILURE"** exist in the Department of Critical Care Medicine, DMC&H, Ludhiana and will be provided to the candidate. We will see that the data being included in the thesis is genuine and is collected by the candidate himself under our supervision and guidance.

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Place : Ludhiana

Date : 6/12/22

APPROVAL PROFORMA
BY RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Name of candidate	Dr. Vaibhav Taneja
Department	Critical Care Medicine
Topic of Thesis	EVALUATION OF CARDIOVASCULAR FUNCTION IN WEANING FAILURE
Likely date of appearing in PG examination	May, 2025
Date of enrollment	30th April, 2022
Name of Head of Department	Dr. Parshotam Lal Gautam
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Approved: Yes / ~~No~~

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BABA FARID UNIVERSITY OF HEALTH SCIENCES,

FARIDKOT

PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

1	NAME OF THE CANDIDATE AND ADDRESS	Dr. VAIBHAV TANEJA HNO 1978, SECTOR-4, REWARI,HARYANA123401
2	NAME OF THE INSTITUTE	DAYANAND MEDICAL COLLEGE AND HOSPITAL
3	COURSE OF STUDY AND SUBJECT	D.M. CRITICAL CARE MEDICINE
4	DATE OF ADMISSION TO COURSE	30/4/2022
5	TITLE OF THE TOPIC	EVALUATION OF CARDIOVASCULAR FUNCTION IN WEANING FAILURE

6.0 BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR STUDY

Weaning is the staged liberation of a patient from assisted ventilation. Weaning critically ill patients from mechanical ventilation (MV) is a tough and demanding process.Weaning should be considered as early as possible and once the primary pathology is resolved.[1] Weaning is divided into three categories (simple, difficult and prolonged weaning).[1] Simple weaning is successful extubation on the first attempt following a spontaneous breathing trial (SBTs). Difficult weaning takes up to three SBTs or up to seven days from the first SBT to be successfully extubated. If the patient fails at least three SBTs or requires more than 7 days from the first SBT to be successfully extubated it is then defined as prolonged weaning.[1]

Weaning failure (WF) is defined as the inability of a patient to pass an SBT or a patient requiring reintubation within 48 hours following extubation.[2,3] Failure to extubate or an early reintubation are both associated with prolonged MV. Prolonged MV is detrimental and is associated with extended ICU stay, additional infrastructure burden, more expenditure, increased morbidity and mortality.[2,4,5]

The pathophysiology of WF is complex and multifactorial . Systemic or multi-systemic comorbidities of various organ systems including cardiovascular, respiratory, endocrine, hematopoietic, metabolic, nutritional, neuromuscular, sepsis and its complications etc. lead to difficult weaning.[6] While the most common cause of WF is pulmonary, cardiac dysfunction in itself is associated with difficult weaning.[7] Altered functioning of the heart with limited cardiovascular reserve is an important risk factor that compounds the weaning process and prolongs the ventilatory requirement.[8] Further weaning failure of cardiovascular origin is mostly underdiagnosed and undertreated due to a lack of clinical suspicion.[7]

Also, the mechanical markers of weaning and are poor in predicting weaning success as they donot take into account the functional physiology of the cardiovascular system.[7] Thereby, a thorough and systemic search of these potentially reversible pathologies is necessary to decrease the duration of MV, prevent long-term complications and improve patient outcomes.

Transthoracic echocardiography (TTE) being noninvasive and reproducible is a very commonly performed cardiac investigation. TTE is frequently used in the ICU at the bedside for assessing the cardiac structure and function in real time.[9] TTE provides comprehensive information on dynamics of cardiac function. This information can be utilised by the critical care team into a clinical management plan to guide therapeutic decision making during the weaning process.[10] In general clinicians must understand the cardiovascular response to weaning and utilize the available tools to guide the wean team.

Therefore, we try to evaluate the transthoracic echocardiographic parameters associated with WF.

6.2 REVIEW OF LITERATURE

Weaning the patient from ventilator support is crucial, and the process needs to be initiated at the earliest and when there is a resolution of primary pathology.[1] In 2005 International Consensus Conference divided weaning into three categories (simple, difficult and prolonged weaning).[1] Simple weaning after a spontaneous breathing trial (SBTs) is successful extubation on the first attempt. Difficult weaning patient takes up to three SBTs or up to seven days from the first SBT to be successfully extubated. If the patient fails at least three SBTs or requires more than 7 days from the first SBT to be successfully extubated it is then defined as prolonged weaning.[1]

WF is defined as inability to pass SBT or requirement of reintubation within 48 hours following extubation.[2,3] The incidence of extubation failure in such patients is around 2 to 25%.[6,11] The pathophysiology of weaning failure is complex and multifactorial. While the most common cause of weaning failure is respiratory, failure to wean from MV may also occur due to abnormal cardiac physiology.[7] Also in addition altered mental status, increased tracheal secretions, inability to cough, critical illness, muscle weakness, sepsis and its complications etc prolong the weaning process.[12] Failure to wean or extubation failure further leads to prolonged MV, increased duration of ICU stay and mortality.[11] Hence identification of such patients who are prone to fail weaning is important.[6]

Mechanical weaning parameters which include breathing frequency, minute ventilation, tidal volume, rapid shallow breathing index (RSBI) and maximum inspiratory pressure only take into account the functioning of the respiratory system.[13] Also, conventional weaning parameters such as rapid shallow breathing index (RSBI) with a value of less than one hundred and five cannot identify the possibility of extubation failure.[14,15] Thus the need for parameters which can guide treating physicians in deciding for extubation has been highlighted by studies.[2,16]

Clinically, cardiovascular etiology as a predominant or a contributing factor to weaning failure can be difficult to distinguish from other causes of weaning failure for two reasons: first, this entity may exist at a subclinical level, i.e., some patients may have an almost normal resting cardiovascular function and conditions of increased oxygen demand and consumption. Second, both subjective (such as discomfort, dyspnea, anxiety) and objective (tachypnea, tachycardia, wheezing, hypoxemia, hypercapnia) criteria for WF are nonspecific and usually incapable of discriminating cardiac from noncardiac causes of weaning failure.[1] Therefore, WF of cardiovascular origin may be underdiagnosed, and, thus, undertreated due to lack of clinical suspicion.[7]

The Cardiopulmonary interactions induced by mechanical ventilation during the weaning process are complex and are associated with changes in hemodynamics. The hemodynamic responses generated during the process of weaning include cardiovascular dysfunction, autonomic alteration, cardiac dysrhythmias, and myocardial ischemia. Among cardiac dysfunction, there is substantial evidence that left ventricular (LV) systolic and diastolic dysfunction leads to difficult weaning.[17] Also, Cardiac dysfunction induced by weaning can occur without any underlying heart disease.[18-21] Briefly, mechanical ventilation with positive airway and intrathoracic pressures reduces venous return and reduce both LV preload and afterload.[22] On the contrary, the shift from mechanical ventilation to spontaneous breathing induces: first, a negative intrathoracic pressure which, (a) increases the systemic venous return pressure gradient, the right ventricular preload, the central blood volume and the LV preload and (b) increases the surrounding pressure of the LV with a resulting increase in LV afterload; second, an increase in the work of breathing, and, third, an increase in adrenergic tone as documented by an increase in serum catecholamine levels.[22,23] These change in intra- thoracic pressure during the process of weaning precipitate cardiac dysfunction.[19-21]

These changes in function and morphology of Cardiovascular system induced during the weaning process can be assessed at the bedside by TTE in real time. TTE provides pivotal information regarding cardiac morphology, systolic function, diastolic function, and other significant cardiac pathology.[23] Measurements of wall thickness and cavity dimensions are essential parameters for assessment of the major determinants of haemodynamics, namely preload, afterload and contractility. In addition, diastolic function as well as ventricular interdependency may be described by echocardiography.[23]

A Prospective Observational Study by Amarja and colleagues on Evaluation of Cardiac Dysfunction Induced during the Weaning Process concluded that echocardiographic measurements prior to extubation with preexisting LV systolic dysfunction could predict extubation. Also they concluded that a higher E/e` post-extubation was associated with chances of reintubation.[24]

In a small trial, Lemaire et al. noted elevation of pulmonary artery occlusion pressure (PAOP) in patients who failed spontaneous breathing trials (SBT).[25] The conclusion of this study was not easily generalizable as the study included difficult to wean chronic obstructive pulmonary disease (COPD) patients and the study was performed in only fifteen patients. Similar trials have been done in the past in subgroups of patients such as COPD, patients with neurological disease, without underlying heart disease or patients without arrhythmia and the external validity of such trials is limited.[26,27]

Recent metaanalysis by sanfiliopo et al concluded that weaning failure from MV is significantly associated with parameters indicating worse LV diastolic function and increased LV filling pressure. The study also highlighted significant gaps regarding the association between weaning failure and other echocardiographic parameters of LV systolic function and RV systolic function.[28]

A study conducted by Roche Campo et al reported a high prevalence of cardiac dysfunction at initiation of weaning. They also concluded that prolonged weaning was associated with a predominantly isolated diastolic rather than systolic dysfunction. Further, echocardiographic parameters suggested that LV relaxation impairment with increased filling pressures may be a key mechanism of failed weaning trials.[29]

A systemic review and meta-analysis by de meirelles Almeida et al evaluated diastolic dysfunction as a cause for weaning failure and showed higher E/e` ratio was associated with weaning failure.[19]

The literature on cardiac dysfunction induced by weaning in a general ICU population in Indian settings is scanty. The predominantly weaning method used in ICU's is PS with PEEP. During the process of weaning heart, lung interactions can cause cardiac dysfunction, and it affects the outcome of extubation. With an increase in the incidence of cardiac co-morbidities and elderly popula- tion the study on cardiac dysfunction induced by weaning is indicated and appropriate. Cardiac dysfunction can be assessed noninvasively by echocardiography at the bedside.[30-33] The aim of the current study is whether the assessment and identification of cardiac dysfunction induced during the weaning process could predict weaning failure in the general ICU population.

HYPOTHESIS:

The pathophysiology of Weaning failure is complex and multifactorial. Systemic or multi-systemic involvement of different organ systems like respiratory, cardiac, endocrine, metabolic, hematopoietic, nutritional, neuromuscular, septic, complications of sepsis etc. lead to difficult weaning. The most common cause of weaning failure is respiratory but cardiac dysfunction in itself is a predictor of weaning failure. The Cardiopulmonary interactions induced by mechanical ventilation during the weaning process are complex and are associated with changes in hemodynamics. The hemodynamic responses to weaning include

cardiovascular dysfunction, autonomic alteration, cardiac dysrhythmias, and myocardial ischemia. Among cardiac dysfunction, there is substantial evidence that LV systolic and diastolic dysfunction leads to difficult weaning. However, there is paucity of literature on right ventricular dysfunction as a contributing factor to weaning failure.

6.3 AIMS AND OBJECTIVES:

Primary objective:

Evaluation of incidence of left and right ventricular dysfunction in patients with weaning failure from ventilator during the weaning process.

Secondary objective:

1. Effect of left ventricular and right ventricular dysfucntion on duration of mechanical ventilation, length of Intensive care unit stay
2. Evaluation of other causes contributing to weaning failure

7.0 MATERIAL AND METHODS:

7.1 SOURCE OF DATA:

Study design: Prospective observational study

Study place: Intensive care units, Dayanand Medical College, Ludhiana

Duration of the Study: 150 patients will be enrolled

7.2 METHOD OF COLLECTION OF DATA

INCLUSION CRITERIA:

- Patients admitted to intensive care units on mechanical ventilation with weaning failure
- Aged 18-70 years

EXCLUSION CRITERIA:

- Inability to obtain clear TTE images
- Tracheostomized patient
- Pregnant patients
- Refusal to participate

STUDY PROTOCOL:

It is a prospective, observational study to be conducted in the IC units of DMCH Ludhiana. The study will be performed on 150 patients admitted to ICU and on those on Mechanical ventilation. Patients will be enrolled and included, after obtaining informed and written consent from patients or legally acceptable representatives. Weaning method used in the study will be pressure support- positive end-expiratory pressure (PS with PEEP) with automatic tube compensation (ATC). After successful completion of SBT by PS with PEEP as per the ICU protocol, patients planned for extubation based on treating physician's decision will be included in the study. The convenience sampling method will be used for patient selection. Baseline Trans Thoracic Echocardiographic (TTE) functional assessment will be done by trained echocardiographers before initiating a SBT in the weaning process. Post SBT Trans Thoracic Echocardiographic (TTE) functional assessment will also be done and recorded. All measurements will be performed by single individual to avoid inter-

observer bias. An average of three recordings over five minutes will be taken to avoid intra- observer bias. The extubation will be performed immediately after the collection of parameters. Weaning failure will be defined as patients who fail to pass SBT, or require reintubation within 48 hours. Trans Thoracic Echocardiographic (TTE) functional assessment will also be done and recorded for patients who are reintubated within 48 hours. The primary outcome of the study will be the incidence of LV and RV dysfunction in patients with weaning failure. Secondary outcomes assessed will be the the effect of cardiovascular dysfucnction on duration of mechanical ventilation and ICU length of stay. Other causes of weaning failure will also be evalauted in secondary outcome. Conventional weaning parameters like respiratory rate, tidal volume, rapid shallow breathing index, pressure support, FiO2, PEEP, PaO2/FiO2 will also be collected. Nutritional assessment will also be done using subjective global assessment. All patients will be followed up until ICU discharge.

Echocardiographic measurements: All measurements will be done using a Sonosite™ Edge portable machine with a 2-2.5 MHz phased array probe and inbuilt cardiac calculation software. LV systolic function will be assessed qualitatively by visual gestalt method taking into account LV size, contractility and thickening of the various segments and classified into good, mild, moderate, moderate to severe and severe LV dysfunction. Qualitative assessment of systolic function will be done due to ease of its use. LV diastolic dysfunction will be assessed by transmitral flow velocity. Early filling phase (E), late filling phase (A) and deceleration time (DCT) which will be measured. Further E/A will be calculated. Assessment of mitral annular flow velocity will be done using tissue Doppler imaging at the lateral mitral annulus. E` and A` will be measured. In patients having regional wall motion abnormalities (RWMA), both lateral and septal mitral leaflet velocities will be measured and averaged. The right ventricular systolic function will be assessed using tricuspid annular plane systolic excursion (TAPSE) and measuring inferior vena cava (IVC) diameter. E/A,

E/e` will be calculated. RV dysfunction will be defined as any of TAPSE < 1.7 cm.

Following data will also be recorded: Name, Age, Sex, days on ventilator, length of icu stay. Any systemic comorbities including cardiac, respiratory, renal or electrolyte abnormailities will be noted. Cumulative fluid balance for last three days before extubation will be calculated and any use of neuromuscular blocking drugs will also be noted.

STATISTICAL ANALYSIS

Prevalence of LV dysfunction is 9.94%.(24) Based on this, sample size (n) will be calculated using formula $n= (Z^2\alpha \times P \times (1-P))/d^2$ Where; Zα = Value of standard normal variate corresponding to α level of significance, P = Likely value of parameter, Q = 1 – P, d = Margin of errors which is a measure of precision. Assuming the Confidence Level = 95% and Precision (d) = ± 5% the sample size works out as 138. 150 patients thus will be included in the study to increase the power of the study. Two tailed 't' test for paired and unpaired data will be used to assess changes between groups. Partial correlation test by Pearson's method will be used to assess univariate relations. The association between analyzed variables and outcome will be established by using Cox proportional hazard. Results will be expressed as hazard ratios with 95% confidence intervals. A two tailed probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO,PLEASE DESCRIBE BRIEFLY.

Use of transthoracic echocardiography for LV and RV function assessment

7.4 HAS ETHICAL CLEARENCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Yes, Attached herewith.

8. LIST OF REFERENCES

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PROFORMA

NAME: MRD: Date:

Age: ___ Yr Gender (M/F): BMI: SOFA score on Pre SBT:

Subjective global assessment score:

Comorbidities:- DM / HTN / COPD / SMOKING /OTHER

Systemic diseases: Cardiac, Renal, Respiratory, Endocrine

Cumulative fluid balance (last 3 days):-

Neuromuscular blocker drug/ steroid use :-

Baseline ABG pre SBT:-

Ph	Po2	Pco2	Hco3-	Lactate	Glucose

Baseline Hemodynamics pre SBT:-

HR	SBP	DBP	MBP	RR

Reason for MV: Neurotrauma, Postsurgical, ALI, Lung infection, Sepsis, Other

Duration of MV pre SBT :-

Echocardiographic assessment	Pre-SBT Values	Post-SBT values	SBT Failure	Reintubation
LVEF (%)				
E (cm/sec)				
A (cm/sec)				
E/A				
DCT (ms)				
Septal e` (cm/sec)				
Septal a` (cm/sec)				
RWMA Lateral e` **(cm/sec)**				
RWMA Lateral a` **(cm/sec)**				
Average e`				
Average a`				
E/e`				
TAPSE (cm/sec)				
IVC (cm) Max $_{\text{dia}}$ **Min** $_{\text{dia}}$ **Compressibility** **Distensibility (%)**				
Diuretics use and time				

Others if any-

Ventilator parameters:

WEANING PARAMETER	PRE SBT	POST SBT	IF NIV USED
Tidal volume			
RR			
RSBI			
PS			
PEEP			
FiO2			
PaO2/FiO2			

Duration of Ventilator days-

Duration of ICU stay (days)-

28 day outcome – Survivor / Non survivor

INCLUDED / EXCLUDED

SIGNATURE OF CANDIDATE SIGNATURE OF SUPERVISOR

INFORMED PATIENT CONSENT

Date: _____

I……..D/o, W/o, S/o……. ……am willing to participate in the study **"EVALUATION OF CARDIOVASCULAR FUNCTION IN WEANING FAILURE"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

…….	……
Signature of the Witness	Signature of the patient / Legal representative
Name:	Name:

Signature of Candidate **Signature of Supervisor**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री
_____ निवासी
_____

इस शोधकार्य "**EVALUATION OF CARDIOVASCULAR FUNCTION IN WEANING FAILURE"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी/प्रतिनिधिके हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक केहस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

_____ਵਾਸੀ_____

“EVALUATION OF CARDIOVASCULAR FUNCTION IN WEANING FAILURE” ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾ ਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

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ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ /ਪ੍ਰਤੀਨਿਧੀ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

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ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

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ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ